

ภาคผนวก ค

หนังสือรับรองผลการตรวจวัดและวิเคราะห์



บริษัท ซีคอต จำกัด
SECOT CO., LTD.

239 ถนนริมคลองประปา แขวงบางซื่อ เขตบางซื่อ กรุงเทพมหานคร 10800

239 RIMKLONGPRAPA ROAD, BANGSUE, BANGKOK 10800, THAILAND

TEL. (662) 959-3600 FAX (662) 959-3535 Website: secot.co.th E-mail: envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|--|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 13/09/2023 | SAMPLING TIME | : 14:30-14:42 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 13, 15-22/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION |
|------------------------|-------|-----------------------|------------------------|---------|
| | | | | MW-2 |
| Depth | m | - | - | 4.11 |
| Temperature | °C | 2550 B | < 0.5 | 32.1 |
| pH | - | 4500-H ⁺ B | < 0.10 | 3.90 |
| Color | Unit | 2120 B | < 5.0 | < 5 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 3,517 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 1,792 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 16 |

REFERENCE: STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Khemchuda Insorn

(Miss Khemchuda Insorn)

Analyst

Araya Tipparuk

(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

2. This report shall not be reproduced, except in full, without official approval.

3. - Not available.



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| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-2 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0009 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA APHA WEF)

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. 7-239-0-0022

Araya Tipparuk

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-0-0004

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| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|---------------------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-2 | |
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| -C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| -C _{>16} -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE: US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED., 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 7-239-ท-0001

Araya T

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-ท-0004

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| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 14:08-14:14 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 13, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | MW-4 |
| Depth | m | - | - | 3.50 |
| Temperature | °C | 2550 B | < 0.5 | 31.0 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.55 |
| Color | Unit | 2120 B | < 5.0 | 10 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 2,784 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 2,245 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 87 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

(Miss Khemchuda Insorn)

Analyst

(Mrs. Araya Tipparuk)

Technical Management Team

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| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-4 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0010 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA APHA WEF)

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

Araya Tipparuk

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

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| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION MW-4 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510.C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED., 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. ๖-239-๖-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

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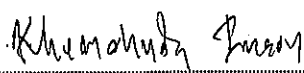
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| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:50-12:15 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 13, 15-22/09/2023 |
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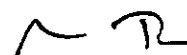
| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | MW-6 |
| Depth | m | - | - | 3.70 |
| Temperature | °C | 2550 B | < 0.5 | 33.8 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.65 |
| Color | Unit | 2120 B | < 5.0 | 90 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 1,017 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 497 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 35 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

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| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-6 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0010 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | 0.0005 | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | 0.0004 | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | 0.0009 | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED., 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

(Mrs. Araya Tipparuk)

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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:50-12:15 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION MW-6 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | 0.009 | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | 0.043 | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | 0.098 | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 7-239-ท-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-ท-0004

- Remark : 1. Reported analysis refers to submitted sample only.
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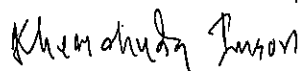
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 10:30-10:45 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 14, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | MW-7 |
| Depth | m | - | - | 2.92 |
| Temperature | °C | 2550 B | < 0.5 | 32.5 |
| pH | - | 4500-H ⁺ B | < 0.10 | 7.02 |
| Color | Unit | 2120 B | < 5.0 | 30 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 318 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 210 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 9 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

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3. - Not available.



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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 10:30-10:45 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-7 | STANDARD ^{1/} |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0018 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. 7-239-ก-0022

Araya Tipparak

(Mrs. Araya Tipparak)

Technical Management Team

REG. NO. 7-239-ก-0004

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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|--|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 14/09/2023 | SAMPLING TIME | : 10:30-10:45 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION MW-7 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 7-239-0-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-0-0004

Remark : 1. Reported analysis refers to submitted sample only.

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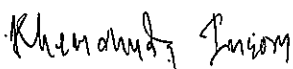
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 13:55-14:07 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 12, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

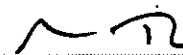
| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | MW-8 |
| Depth | m | - | - | 4.60 |
| Temperature | °C | 2550 B | < 0.5 | 32.9 |
| pH | - | 4500-H ⁺ B | < 0.10 | 3.70 |
| Color | Unit | 2120 B | < 5.0 | 20 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 8,411 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 4,848 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 9 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF).



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

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3. - Not available.



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GROUND WATER ANALYSIS REPORT

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| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 13:55-14:07 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-8 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0011 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA APHA WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๓-239-๓-0022

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๓-239-๓-0004

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GROUND WATER ANALYSIS REPORT

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| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
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| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION MW-8 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| Total Petroleum Hydrocarbons | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE: US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 2-239-1-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 2-239-1-0004

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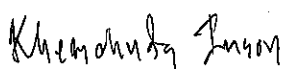
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 14:20-14:48 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 12, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | MW-10 |
| Depth | m | - | - | 3.40 |
| Temperature | °C | 2550 B | < 0.5 | 30.9 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.51 |
| Color | Unit | 2120 B | < 5.0 | 40 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 942 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 524 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 45 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 14:20-14:48 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION | STANDARD ¹⁾ |
|----------------------------|------|----------|------------------|---------|------------------------|
| | | METHODS | (non-detectable) | MW-10 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0012 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๓-0022

Araya Tipparuk

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๓-0004

- Remark :
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 3. ¹⁾ Notification of the Ministry of Industry, B.E.2559 (2016).



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239 RIMKLONGPRAPA ROAD, BANGSUE, BANGKOK 10800, THAILAND

TEL. (662) 959-3600 FAX (662) 959-3535 Website: secot.co.th E-mail: envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|--|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 12/09/2023 | SAMPLING TIME | : 14:20-14:48 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION MW-10 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|------------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 2-239-ก-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 2-239-ก-0004

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239 RIMKLONGPRAPA ROAD, BANGSUE, BANGKOK 10800, THAILAND

TEL. (662) 959-3600 FAX (662) 959-3535 Website: secot.co.th E-mail: envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 09:58-10:15 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 14, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION |
|------------------------|-------|-----------------------|------------------------|---------|
| | | | | MW-16 |
| Depth | m | - | - | 4.24 |
| Temperature | °C | 2550 B | < 0.5 | 32.5 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.54 |
| Color | Unit | 2120 B | < 5.0 | 240 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 1,195 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 716 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 80 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

(Miss Khemchuda Insorn)

Analyst

(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

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3. - Not available.



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GROUND WATER ANALYSIS REPORT

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|------------------|---|---------------------|---------------------------|
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| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
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| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | MW-16 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0013 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED., 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

Araya Tipparuk

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

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GROUND WATER ANALYSIS REPORT

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|------------------|---|---------------------|---------------------------|
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| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND | STATION | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------|---------|------------------------|
| | | | (non-detectable) | MW-16 | |
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED. 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 7-239-ก-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-ก-0004

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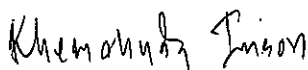
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:25-11:35 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 13, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

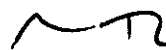
| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | |
| Depth | m | - | - | 3.95 |
| Temperature | °C | 2550 B | < 0.5 | 32.5 |
| pH | - | 4500-H ⁺ B | < 0.10 | 5.98 |
| Color | Unit | 2120 B | < 5.0 | 730 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 809 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 590 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 18 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED., 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

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3. - Not available.



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239 RIMKLONGPRAPA ROAD, BANGSUE, BANGKOK 10800, THAILAND

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GROUND WATER ANALYSIS REPORT

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| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
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| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION | STANDARD ^{1/} |
|----------------------------|------|----------|------------------|---------|------------------------|
| | | METHODS | (non-detectable) | GW-1 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0034 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | 0.0003 | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE: STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF).

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

NT
(Mrs. Araya Tippiaruk)

Technical Management Team

REG. NO. ๖-239-๖-0004

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GROUND WATER ANALYSIS REPORT

| | | | |
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| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 13/09/2023 | SAMPLING TIME | : 11:25-11:35 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION GW-1 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₉ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetraatriacontane | | | | | |
| - n-Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE. 3rd ED., 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. ๖-239-๖-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

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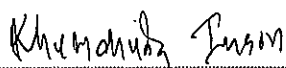
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|--|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 12/09/2023 | SAMPLING TIME | : 11:54-12:10 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 12, 15-22/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

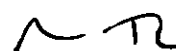
| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION |
|------------------------|-------|-----------------------|------------------------|---------|
| | | | | GW-4 |
| Depth | m | - | - | 3.40 |
| Temperature | °C | 2550 B | < 0.5 | 32.9 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.60 |
| Color | Unit | 2120 B | < 5.0 | 140 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 856 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 508 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 18 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED., 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

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3. - Not available.



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TEL. (662) 959-3600 FAX (662) 959-3535 Website : secot.co.th E-mail : envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:54-12:10 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ^{1/} |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | GW-4 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0015 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๓-239-๓-0022

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๓-239-๓-0004

Remark : 1. Reported analysis refers to submitted sample only.

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3. ^{1/} Notification of the Ministry of Industry, B.E.2559 (2016).



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TEL. (662) 959-3600 FAX (662) 959-3535 Website : secot.co.th E-mail : envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:54-12:10 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION GW-4 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₉ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED. 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 2-239-0-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 2-239-0-0004

Remark : 1. Reported analysis refers to submitted sample only.

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3. ^{1/} Notification of the Ministry of Industry, B.E.2559 (2016).



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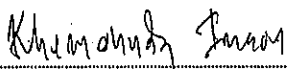
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:33-11:42 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 12, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

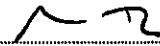
| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | GW-5 |
| Depth | m | - | - | 2.91 |
| Temperature | °C | 2550 B | < 0.5 | 33.0 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.15 |
| Color | Unit | 2120 B | < 5.0 | 130 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 456 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 272 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 34 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED., 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

- Remark : 1. Reported analysis refers to submitted sample only.
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GROUND WATER ANALYSIS REPORT

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|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:33-11:42 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ¹⁾ |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | GW-5 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0015 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23RD ED. 2017 (AWWA, APHA, WEF).

Jutarat Jaemruen

(Miss Jutarat Jaemruen)

Analyst

REG. NO. 7-239-1-0022

Araya Tipparuk

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-1-0004

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3. ¹⁾ Notification of the Ministry of Industry, B.E.2559 (2016).



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GROUND WATER ANALYSIS REPORT

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|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
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| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION GW-5 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| Total Petroleum Hydrocarbons | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 7-239-ท-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-ท-0004

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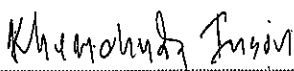
TEL. (662) 959-3600 FAX (662) 959-3535 Website: secot.co.th E-mail: envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 10:49-11:06 |
| SAMPLING DATE | : 12/09/2023 | ANALYTICAL DATE | : 12, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | GW-8 |
| Depth | m | - | - | 3.06 |
| Temperature | °C | 2550 B | < 0.5 | 32.5 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.79 |
| Color | Unit | 2120 B | < 5.0 | 35 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 180 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 138 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 51 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

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GROUND WATER ANALYSIS REPORT

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| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
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| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ¹⁾ |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | GW-8 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0019 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED., 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๓-239-๓-0022

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๓-239-๓-0004

- Remark :
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 3. ¹⁾ Notification of the Ministry of Industry, B.E.2559 (2016):



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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|--|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 12/09/2023 | SAMPLING TIME | : 10:49-11:06 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION GW-8 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|-----------------|------------------------|
| Total Petroleum Hydrocarbons | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₉ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetatriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED., 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 3-239-ก-0001

Araya T.

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 3-239-ก-0004

Remark : 1. Reported analysis refers to submitted sample only.

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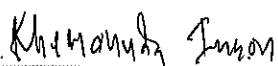
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|--|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. (Feeder Line Project) | REQUEST SERVICE No. | : 1609/66 |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING DATE | : 14/09/2023 | SAMPLING TIME | : 11:00-11:24 |
| RECEIVED DATE | : 15/09/2023 | ANALYTICAL DATE | : 14, 15-22/09/2023 |
| REPORT DATE | : 25/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| SAMPLE CONDITION | : Normal | FILE CODE | : 223100_GW_September |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | GW-11 |
| Depth | m | - | - | 2.50 |
| Temperature | °C | 2550 B | < 0.5 | 34.0 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.46 |
| Color | Unit | 2120 B | < 5.0 | 80 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 1,784 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 823 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 78 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:00-11:24 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION | STANDARD ¹⁾ |
|----------------------------|------|----------|------------------|---------|------------------------|
| | | METHODS | (non-detectable) | GW-11 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0013 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

Araya Tipparuk
(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๓-0004

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GROUND WATER ANALYSIS REPORT

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|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:00-11:24 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION GW-11 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|------------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetracontane | | | | | |
| - n-Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED. 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. ๖-239-๖-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

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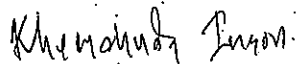
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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 14:55-15:20 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 13, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

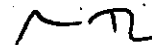
| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|---------|
| | | METHODS | (non-detectable) | GW-17 |
| Depth | m | - | - | 2.94 |
| Temperature | °C | 2550 B | < 0.5 | 33.9 |
| pH | - | 4500-H ⁺ B | < 0.10 | 5.52 |
| Color | Unit | 2120 B | < 5.0 | 15 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 3,596 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 1,868 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 29 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insorn)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

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3. - Not available.



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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|-----------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. : | 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 14:55-15:20 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | STANDARD ¹⁾ |
|----------------------------|------|---------------------|------------------------|---------|------------------------|
| | | | | GW-17 | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0019 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๓-239-๓-0022

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๓-239-๓-0004

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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 14:55-15:20 |
| SAMPLING DATE | : 13/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION GW-17 | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|------------------|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₉ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 7-239-0-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 7-239-0-0004

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GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:50 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 14, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|--------------------------------|
| | | METHODS | (non-detectable) | บ่อน้ำบาดาลบริเวณชุมชนบ้านทุ่ง |
| Temperature | °C | 2550 B | < 0.5 | 32.0 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.77 |
| Color | Unit | 2120 B | < 5.0 | < 5 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 1,171 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 660 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 8 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

(Miss Khemchuda Insorn)

Analyst

(Mrs. Araya Tipparuk)

Technical Management Team

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TEL. (662) 959-3600 FAX (662) 959-3535 Website: secot.co.th E-mail: envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:50 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION | STANDARD ¹⁾ |
|----------------------------|------|----------|------------------|--------------------------------|------------------------|
| | | METHODS | (non-detectable) | บ่อน้ำบาดาลบริเวณชุมชนบ้านทุ่ง | |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0026 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

Araya Tipparuk
(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

- Remark :
1. Reported analysis refers to submitted sample only.
 2. This report shall not be reproduced, except in full, without official approval.
 3. ¹⁾ Notification of the Ministry of Industry, B.E.2559 (2016).



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SECOT CO., LTD.

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239 RIMKLONGPRAPA ROAD, BANGSUE, BANGKOK 10800, THAILAND

TEL. (662) 959-3600 FAX (662) 959-3535 Website: secot.co.th E-mail: envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 11:50 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION บ่อน้ำบาดาลบริเวณชุมชนบ้านทุ่ง | STANDARD ^{1/} |
|-------------------------------------|------|---------------------|------------------------|---|------------------------|
| Total Petroleum Hydrocarbons | | | | | |
| - C ₅ -C ₈ | mg/l | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₉ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE, 3rd ED., 2020

Sudaporn S.
(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 2-239-ก-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 2-239-ก-0004

Remark : 1. Reported analysis refers to submitted sample only.

2. This report shall not be reproduced, except in full, without official approval.

3. ^{1/} Notification of the Ministry of Industry, B.E.2559 (2016).



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SECOT CO., LTD.

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239 RIMKLONGPRAPA ROAD, BANGSUE, BANGKOK 10800, THAILAND

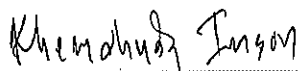
TEL. (662) 959-3600 FAX (662) 959-3535 Website : secot.co.th E-mail : envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 12:10 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 14, 15-22/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS | ND | STATION |
|------------------------|-------|-----------------------|------------------|----------------------------------|
| | | METHODS | (non-detectable) | บ่อน้ำบาดาลบริเวณวัดใหม่เนินพยอม |
| Temperature | °C | 2550 B | < 0.5 | 33.4 |
| pH | - | 4500-H ⁺ B | < 0.10 | 6.71 |
| Color | Unit | 2120 B | < 5.0 | < 5 |
| Conductivity | µS/cm | 2510 B | < 1.0 | 1,037 |
| Total Dissolved Solids | mg/l | 2540 C | < 50 | 560 |
| Total Suspended Solids | mg/l | 2540 D | < 5 | 5 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)



(Miss Khemchuda Insom)

Analyst



(Mrs. Araya Tipparuk)

Technical Management Team

Remark : 1. Reported analysis refers to submitted sample only.

2. This report shall not be reproduced, except in full, without official approval.

3. - Not available.



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TEL. (662) 959-3600 FAX (662) 959-3535 Website : secot.co.th E-mail : envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|--------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 12:10 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 20-21/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION | |
|----------------------------|------|---------------------|------------------------|----------------------------------|------------------------|
| | | | | บ่อน้ำบาดาลบริเวณวัดใหม่เนินพยอม | STANDARD ^{1/} |
| Benzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| Carbon tetrachloride | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.4 |
| 1,2-Dichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.5 |
| Dichloromethane | mg/l | 6200 B | < 0.0002 | 0.0023 | ≤ 6.0 |
| 1,1-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.1 |
| cis-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| trans-1,2-Dichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| Ethylbenzene | mg/l | 6200 B | < 0.0002 | ND | ≤ 2.0 |
| Styrene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Tetrachloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.9 |
| Toluene | mg/l | 6200 B | < 0.0002 | ND | ≤ 5.0 |
| 1,1,1-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.2 |
| 1,1,2-Trichloroethane | mg/l | 6200 B | < 0.0002 | ND | ≤ 0.8 |
| Trichloroethylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 4.4 |
| m-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| o-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| p-Xylene | mg/l | 6200 B | < 0.0002 | ND | ≤ 24 |
| Total Xylenes | mg/l | 6200 B | < 0.0006 | ND | ≤ 24 |
| Vinyl Chloride | mg/l | 6200 B | < 0.0005 | ND | ≤ 0.03 |

REFERENCE : STANDARD METHODS FOR EXAMINATION OF WATER AND WASTEWATER 23rd ED. 2017 (AWWA, APHA, WEF)

Jutarat Jaemruen
(Miss Jutarat Jaemruen)

Analyst

REG. NO. ๖-239-๖-0022

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. ๖-239-๖-0004

Remark : 1. Reported analysis refers to submitted sample only.

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3. ^{1/} Notification of the Ministry of Industry, B.E.2559 (2016).



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SECOT CO., LTD.

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TEL. (662) 959-3600 FAX (662) 959-3535 Website : secot.co.th E-mail : envserv@secot.co.th

GROUND WATER ANALYSIS REPORT

| | | | |
|------------------|---|---------------------|---------------------------|
| CLIENT NAME | : Kuwait Petroleum Aviation (Thailand) Ltd. | REQUEST SERVICE No. | : 1609/66 |
| | (Feeder Line Project) | SAMPLING METHOD | : Pneumatic Bladder Pump |
| SAMPLING BY | : SECOT Co., Ltd. | SAMPLING TIME | : 12:10 |
| SAMPLING DATE | : 14/09/2023 | ANALYTICAL DATE | : 19-20/09/2023 |
| RECEIVED DATE | : 15/09/2023 | SITE OPERATOR | : Mr. Jeerawat Khothamhan |
| REPORT DATE | : 25/09/2023 | FILE CODE | : 223100_GW_September |
| SAMPLE CONDITION | : Normal | | |

| PARAMETER | UNIT | ANALYSIS METHODS | ND (non-detectable) | STATION ป้อมปราบตลาดบริเวณวัดใหม่เนินพยอม | STANDARD ^{1/} |
|-------------------------------------|-------|---------------------|------------------------|--|------------------------|
| <u>Total Petroleum Hydrocarbons</u> | | | | | |
| - C ₅ -C ₈ | mg/l. | 5030 C / 8260 D | < 0.003 | ND | ≤ 1.4 |
| - Pentane | | | | | |
| - Benzene | | | | | |
| - Toluene | | | | | |
| - m,p-Xylene | | | | | |
| - o-Xylene | | | | | |
| - C ₈ -C ₁₆ | mg/l | 3510 C / 8015 D | < 0.025 | ND | ≤ 1.7 |
| - n-Nonane | | | | | |
| - n-Decane | | | | | |
| - n-Dodecane | | | | | |
| - n-Tetradecane | | | | | |
| - n-Hexadecane | | | | | |
| - C ₁₆ -C ₃₅ | mg/l | 3510 C / 8015 D | < 0.050 | ND | ≤ 0.1 |
| - n-Octadecane | | | | | |
| - n-Eicosane | | | | | |
| - n-Docosane | | | | | |
| - n-Tetracosane | | | | | |
| - n-Hexacosane | | | | | |
| - n-Octacosane | | | | | |
| - n-Triacontane | | | | | |
| - n-Dotriacontane | | | | | |
| - n-Tetratriacontane | | | | | |
| - Pentatriacontane | | | | | |

REFERENCE : US EPA SW 846 TEST METHODS FOR EVALUATING WATER AND SOLID WASTE 3rd ED. 2020

Sudaporn S.

(Miss Sudaporn Soonthorn)

Analyst

REG. NO. 2-239-จ-0001

(Mrs. Araya Tipparuk)

Technical Management Team

REG. NO. 2-239-ค-0004

Remark : 1. Reported analysis refers to submitted sample only.

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ภาคผนวก ง

ใบแสดงการตรวจเทียบเครื่องมือตรวจวัดและวิเคราะห์



Request Service No. 098/66

Page 1 of 3

Calibration Certificate

Nomenclature : Brand : Mettler Toledo Type : Top-Loading Electronic Balance

Model : AG245 Serial No. : 1117293916 (198129-0)

Submitted by : Laboratory of SECOT CO., LTD.

Location of Calibration : BAL Room , 6th Floor, Secot Co., Ltd.

Calibration range : 0 – 200 g Scale division : 0.00001 g (41g)/ 0.0001 g (210g)

Calibration date : May 25, 2023

Reference Standard No. M220177, M2302167S, M2303005N

Traceable to : Metrological Center SCI ECO Services Company Limited.

Thai Calibration Services CO., LTD.

Ambient Condition : Temperature 25.70 - 25.90 °C

Humidity 50.70 – 51.20 % RH

Calibrated By : Sasipa Jaidee Approved By : Miss Narisa Poowasanpetch

(Miss Sasipa Jaidee)

(Miss Narisa Poowasanpetch)

Testing Officer

Chief of Technical Management

Date : 25/05/2023

Date : 25/05/2023

Issued Date : May 26, 2023

Measurement Report

Request Service No. 098/66

Page 2 of 3

Description : Brand : Mettler Toledo

Type : Top-Loading Electronic Balance

Model : AG245

Serial No. : 1117293916 (198129-0)

Calibration range : 0 – 200 g

Scale division : 0.00001 g (41g)/ 0.0001 g (210g)

Calibration date : May 25, 2023

Ambient Condition : Temperature 25.70-25.90 °C Relative humidity 50.70-51.20 % RH

Measurement data :

1. Repeatability of Reading :

| Load (g) | Standard Deviation of Reading (g) | Maximum Difference between Successive Reading (g) |
|----------|-----------------------------------|---|
| 50 | 0.000052 | 0.0001 |
| 100 | 0.000071 | 0.0002 |
| 150 | 0.000067 | 0.0002 |
| 200 | 0.000071 | 0.0002 |

2. Off-Center Loading :

A Mass of 50.0000 g was placed and moved to various position on the pan.

Unit : g

| Center | Front | Left | Back | Right | Center | Maximum Difference |
|----------|----------|----------|----------|----------|----------|--------------------|
| 50.00040 | 50.00062 | 50.00078 | 50.00000 | 50.00010 | 50.00040 | 0.00038 |

Issued Date : May 26, 2023

3. Departure from Nominal Valve :

| Reading (g) | Correction (g) | Uncertainty (+/- g) |
|-------------|----------------|---------------------|
| 0 | 0.000000 | ± 0.000008 |
| 0.5 | -0.000017 | ± 0.000014 |
| 1 | -0.000026 | ± 0.000018 |
| 10 | -0.000099 | ± 0.000033 |
| 20 | -0.000168 | ± 0.000046 |
| 40 | -0.000339 | ± 0.000072 |
| 60 | -0.00058 | ± 0.00011 |
| 80 | -0.00059 | ± 0.00014 |
| 100 | -0.00070 | ± 0.00016 |
| 120 | -0.00069 | ± 0.00018 |
| 140 | -0.00096 | ± 0.00020 |
| 160 | -0.00082 | ± 0.00023 |
| 180 | -0.00089 | ± 0.00024 |
| 200 | -0.00118 | ± 0.00027 |

Calibrated by : Sasipa Jaidee Approved By : Narisa Poowasanpetch

(Miss Sasipa Jaidee)

(Miss Narisa Poowasanpetch)

Testing Officer

Chief of Technical Management

Date : 25/05/2023Date : 25/05/2023

Issued Date : May 26, 2023



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.: 23CH4
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Hanna
Model : HI98190
Serial No. : 06470022101
ID No. : pH No.19
Condition As-Received: Used Item
Received Date : 03 January 2023
Calibration Date : 04 January 2023
Reference : 2301-0006DN-1
Submitted by : Secot Co.,Ltd.
239 Rimklongprapa Road,
Bangsue, Bangkok 10800
Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 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 Lerngagtrakul

Approved by : Malee Butkruea
Approved Signatory

(☒) Malee Butkruea
() Salthip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 10 January 2023

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.



Cert.No.: 23CH4

Page.: 2 of 3

Condition of this calibration result**1. Reference Standard Instrument :-**

| Instrument | Serial No. | ID No. | Cert. No. | Due Date |
|------------------------------|------------|----------|-----------|-------------|
| 1) Ref. Standard Thermometer | 4982054 | 110RC044 | 2211306 | 27 Oct 2023 |

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 | 826588 | 09 July 2024 |
| pH 6.987 | CPA chem | 823322 | 20 June 2023 |
| pH 10.008 | CPA chem | 826590 | 09 July 2023 |

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

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 (\pm) | Coverage factor k |
|--------------------------------|-----------------------------|-------------------|------------------------|---|-------------------|
| pH Electrode S/N.: 0920044N | 4.008 | 4.010 | 157.9 | 0.0044 | 2.00 |
| | 6.987 | 6.990 | -1.6 | 0.0086 | 2.00 |
| | 10.008 | 10.007 | -163.7 | 0.0065 | 2.00 |

Remark - Can not connect the BNC because the plug does not match with the socket.

Cert.No.: 23CH4

Page.: 3 of 3

Calibration Results**Function : Temperature Measurement****(*) Without adjustment**

This equipment was connected with Temperature Probe;

| | |
|---------------------|----------|
| - Model : | HI12963 |
| - Serial No. : | 0920044N |
| Dimension of probe; | |
| - Length : | 105 mm. |
| - Diameter : | 14 mm. |
| - Immersion Depth : | 100 mm. |

| Calibration Point (°C) | Standard Temperature (°C) | UUC* Reading (°C) | Error (°C) | Uncertainty of measurement (\pm °C) | Coverage factor k |
|------------------------|---------------------------|-------------------|------------|--|-------------------|
| 20.0 | 20.002 | 20.0 | -0.002 | 0.13 | 2.00 |
| 25.0 | 25.003 | 25.0 | -0.003 | 0.13 | 2.00 |
| 30.0 | 30.005 | 30.0 | -0.005 | 0.13 | 2.00 |
| 35.0 | 35.002 | 35.0 | -0.002 | 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 %.

-o0o-



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



Cert.No.: 22CH1624
Page.: 1 of 2

Certificate of Calibration

Equipment : Conductivity Meter
Manufacturer : Hanna
Model : HI98192
Serial No. : 05200045101
ID No. : -
Condition As-Received: Used Item
Received Date : 22 November 2022
Calibration Date : 23 November 2022
Reference : 2211-0761DN-2
Submitted by : Secot Co., Ltd.
239 Rimklongprapa Road,
Bangsue, Bangkok 10800
Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure: In-house method :
- CP-CH6 : based on direct measurement by
using certified reference material (CRM)
Calibrated by : Walalak Sirithean
Approved by :
() Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul
Issue Date : 25 November 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 0047740



Cert.No.: 22CH1624

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 | 221484 | 17 Apr 2023 |

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 calibration solution, Thermo Scientific (traceable to NIST)

| Conductivity Solution | Manufacturer | Lot No. | Exp. date |
|-----------------------|-------------------|---------|--------------|
| *100 $\mu\text{S/cm}$ | Thermo Scientific | 152/01 | 14 Apr 2023 |
| 1.413 mS/cm | CPA Chem | 823328 | 20 June 2023 |
| 12.880 mS/cm | CPA Chem | 823329 | 20 June 2023 |

- Control Conductivity calibration solution temperature by Water bath $(25 \pm 0.1) ^\circ\text{C}$

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

Calibration results

Function : Conductivity Measurement

(*) After Adjustment at 1.413, 12.880 mS/cm

Conductivity Electrode Serial No.: 0720001N

| Standard Conductivity Solution | Before Adjustment UUC* Reading | After Adjustment UUC* Reading | Uncertainty of Measurement (\pm) | Coverage factor k |
|-----------------------------------|-----------------------------------|----------------------------------|--|-------------------------|
| *100 $\mu\text{S/cm}$ | 99.36 $\mu\text{S/cm}$ | 106.6 $\mu\text{S/cm}$ | 5.1 $\mu\text{S/cm}$ | 2.00 |
| 1.413 mS/cm | 1.296 mS/cm | 1.412 mS/cm | 0.0093 mS/cm | 2.00 |
| 12.880 mS/cm | 10.86 mS/cm | 12.88 mS/cm | 0.086 mS/cm | 2.00 |

Remark - UUC* = Unit Under Calibration
- * = Not NSC - ONSC Accredited

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-

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BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
 E-mail: bkk@becthai.com Website: www.becthai.com



NSC-TIS-TIS 17025
 CALIBRATION D131

Certificate No. : CAL-23-150

Page : 1 of 4

CERTIFICATE OF CALIBRATION

Equipment : Spectrophotometer
 Manufacturer : Thermo Scientific
 Model : Genesys 150 UV-VIS
 Serial No. : 9A5Y332022
 ID No. : N/A
 Customer : Secot Company Limited
 : 239 Rimklongprapa Road,
 : Bangsue, Bangkok 10800, Thailand
 Location : Laboratory Room
 Date of Receipt : 27 February 2023
 Date of Calibration : 27 February 2023
 Date of Issue : 8 March 2023
 Ambient Temperature : (25±10) °C
 Relative Humidity : (60±20) %
 Condition As-Received : Used Item

Calibrated by

Mr. Anusit Boonmee

(Mr. Anusit Boonmee)

Calibration Engineer

Approved by

Ms. Jintana Sangthajaroenlap

(Ms. Jintana Sangthajaroenlap)

Calibration Manager

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.



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CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
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NSC-TIS-TIS 17025
 CALIBRATION 0131

Certificate No. : CAL-23-150

Page : 2 of 4

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material :

| Material | Model | Serial No. | Cert.No. | Due date |
|-------------------------------|-----------|------------|----------|-----------|
| Holmium Glass Filter | RM-HG | 12705 | 98236 | 12 Feb 24 |
| Didymium Glass Filter | RM-DG | 13498 | 98233 | 12 Feb 24 |
| Neutral Density Filter | RM-1N2N3N | 8323 | 98259 | 13 Feb 24 |
| Potassium Dichromate Solution | RM-06 | 23429 | 98252 | 12 Feb 24 |

2. Traceability : This certification is traceable to the International System of Unit maintained at;

The Stama Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :

The calibration procedure was carried out according to ASTM E275-08 (2022) and ASTM E925-09 (2014).

4. Result of calibration :

(✓) without adjustment

() after adjustment

5. Equipment Specifications:

| | | |
|----------------------|------|--------|
| Spectral Bandwidth : | 2 | nm |
| Data Interval : | 0.2 | nm |
| Scan Speed : | Slow | nm/min |



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Certificate No. : CAL-23-150

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CALIBRATION REPORT

Wavelength Calibration

| Certified Values of Reference Material (nm) | Nominal Value (nm) | UUC* Reading (nm) | Error (nm) | Uncertainty of Measurement (\pm nm) |
|--|-----------------------|----------------------|---------------|---|
| 241.74 | 241.74 | 241.955 | 0.215 | 0.16 |
| 637.98 | 637.98 | 637.751 | -0.229 | 0.17 |
| 879.27 | 879.27 | 879.075 | -0.195 | 0.16 |

Photometric Calibration for Visible

| Wavelength (nm) | Certified Values of Reference Material (A) | UUC* Reading (A) | Error (A) | Uncertainty of Measurement (\pm A) |
|--------------------|---|---------------------|--------------|--|
| 420.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5716 | 0.573 | 0.0014 | 0.0044 |
| | 0.7358 | 0.733 | -0.0028 | 0.0040 |
| | 1.0713 | 1.073 | 0.0017 | 0.0039 |
| 440.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.561 | 0.562 | 0.0010 | 0.0042 |
| | 0.718 | 0.715 | -0.0030 | 0.0037 |
| | 1.0459 | 1.047 | 0.0011 | 0.0037 |
| 465.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5111 | 0.512 | 0.0009 | 0.0044 |
| | 0.6618 | 0.660 | -0.0018 | 0.0035 |
| | 0.9635 | 0.965 | 0.0015 | 0.0034 |
| 546.1 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5222 | 0.523 | 0.0008 | 0.0036 |
| | 0.6687 | 0.667 | -0.0017 | 0.0031 |
| | 0.9768 | 0.978 | 0.0012 | 0.0043 |
| 590.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5541 | 0.554 | -0.0001 | 0.0035 |
| | 0.6975 | 0.695 | -0.0025 | 0.0031 |
| | 1.0206 | 1.021 | 0.0004 | 0.0044 |
| 635.0 | Zero | 0.000 | 0.0000 | 0.0028 |
| | 0.5398 | 0.540 | 0.0002 | 0.0035 |
| | 0.6658 | 0.664 | -0.0018 | 0.0033 |
| | 0.9741 | 0.974 | -0.0001 | 0.0044 |

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:

UUC* : Unit Under Calibration



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 E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-23-150

Page : 4 of 4

CALIBRATION REPORT

Photometric Calibration for UV

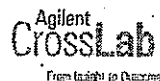
| Wavelength (nm) | Certified Values of Reference Material (A) | UUC* Reading (A) | Error (A) | Uncertainty of Measurement (\pm A) |
|--------------------|---|---------------------|--------------|--|
| 235.0 | Zero | 0.000 | 0.0000 | 0.0050 |
| | 0.7345 | 0.735 | 0.0005 | 0.0075 |
| 257.0 | Zero | 0.000 | 0.0000 | 0.0050 |
| | 0.8498 | 0.849 | -0.0008 | 0.0074 |
| 313.0 | Zero | 0.000 | 0.0000 | 0.0050 |
| | 0.2853 | 0.286 | 0.0007 | 0.0055 |
| 350.0 | Zero | 0.000 | 0.0000 | 0.0050 |
| | 0.6306 | 0.629 | -0.0016 | 0.0063 |

Remark : The Potassium Dichromate Filled cells are measured against a Perchloric acid blank.

Note:

UUC* : Unit Under Calibration

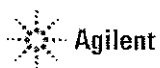
- End of Report -



Agilent CrossLab Start Up Services Agilent 7890 Gas Chromatograph Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the preventive maintenance activities.



Agilent 7890 GC Preventive Maintenance Checklist



Introduction

Customer Information

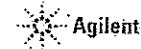
- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- For more information about *Agilent Technologies services*, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The *Agilent Community* is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access *Agilent University*, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful *Agilent Resource Center* web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our *Support Home* page <http://www.agilent.com/search/support>.
- Videos about specific preparation requirements for your instrument can be found by searching the *Agilent YouTube* channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
 - **Safety**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - **Installation and First Startup**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf
 - **Operation Manual**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf
 - **Maintaining Your GC**
https://www.agilent.com/cs/library/usermanuals/public/GS43D-90052%207890B_Maintaining%20GCuide.pdf

Revision: 2.00, Issued: December 30, 2020
Agile Document Number: D0007063
DE number: 44165.759722222
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Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table below.

Instrument System Name and ID

CNA3201053

Instrument System Site and Location

SECOT, Bangkok

List System Component Product Numbers

List the Serial Numbers of each Component

| | | |
|-----|--------|------------|
| 1. | G7440A | CN13201053 |
| 2. | G4513A | CN13360146 |
| 3. | G4514A | CN13230091 |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |
| 8. | | |
| 9. | | |
| 10. | | |

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes.
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the Inlets installed, perform inlet maintenance as defined in the 7890 manual - "Maintaining Your GC" - for the Inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☐ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination - clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☐ Section NOT applicable
- ☒ Check all cabling and configuration settings between GC, tray, and injectors.
- ☒ Vacuum or remove any dust, especially around fans.
- ☒ Check operation of all fans.
- ☒ Check syringe for smooth plunger operation.
- ☒ Check for smooth operation of the needle support - clean if necessary

Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Browser interface or Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values.
Results should be similar or lower than the detector outputs recorded prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Signature Page

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
☒ Update/reset instrument maintenance counters as appropriate.
☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
☒ Complete the Service Engineer Comments section if there are additional comments.
☒ Review with the customer this service, parts replaced, and test results obtained.
☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.
☐ Supply the customer with a copy of the Smart Alerts flyer.
☐ Describe Smart Alerts to the customer.
☐ Install Smart Alerts if requested.

7890 GC Test Results Table

| Detector Signal Outputs | Before PM Service | After PM Service |
|---------------------------------|----------------------|--------------------|
| Front detector output | N/A | N/A |
| Back detector output | | |
| AUX detector output | | |
| Pressure decay test | Expected test result | Actual test result |
| Front inlet pressure decay test | Pass | Pass |
| Back inlet pressure decay test | Pass | N/A |

7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

| Part description | Part number | Product or model# where used | Quantity consumed |
|--|-------------|------------------------------|-------------------|
| SSL Capillary Inlet PM kit, Splitless | 5188-6497 | 7890A/B | 1 |
| SSL Capillary Inlet PM kit, split | 5188-6496 | 7890A/B | 1 |
| SSL Capillary Ultra Inert Inlet Gold Seal with Washer | 5190-6144 | 7890A/B | N/A |
| SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool | 5190-2293 | 7890A/B | |
| SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool | 5190-2295 | 7890A/B | |
| PP Inlet PM kit | 5188-6498 | 7890A/B | |
| Split vent trap PM kit, single cartridge (for MMI, PTV & VI) | 5188-6495 | 7890A/B | |
| MMI Cleaning Kit | G3510-60820 | 7890A/B | |
| PTV Septumless Head Rebuild Kit | 5182-9747 | 7890A/B | |
| PTV Septumless Head Teflon Guide | 5182-9748 | 7890A/B | |
| Ignitor (glow plug) assembly with O-ring | 19231-60680 | 7890A/B | |
| FID Collector Rebuild/Cleaning Kit | G1531-67000 | 7890A/B | |
| Standard .011-inch FID Jet for capillary FID base | G1531-80560 | 7890A/B | |
| High Temperature .018-inch FID Jet for capillary FID base | G1531-80620 | 7890A/B | |
| Standard .018-inch FID Jet for packed column with packed FID base | 18710-20119 | 7890A/B | |
| Standard .011-inch FID Jet for capillary column with packed/adaptable FID base | 19244-80560 | 7890A/B | |
| High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base | 19244-80620 | 7890A/B | |
| NPD Jet, universal fit, .011-inch ID | G1534-80580 | 7890A/B | |
| NPD Jet, universal fit, .011-inch ID Extended tip | G1534-80590 | 7890A/B | |
| SSL Capillary Ultra Inert Inlet Gold Seal with Washer | 5190-6144 | 7890A/B | |
| SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool | 5190-2293 | 7890A/B | |
| **FID Collector Replacement Kit, if needed | G1531-67001 | 7890A/B | |

Service Engineer Comments

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write include them in this box.

Service Completion

Service request number 6005890893 Date service completed 22 Feb 2023
 Agilent signature [Signature] Customer signature [Signature]
 Total number of pages in this document _____

Agilent Preventive Maintenance Services

Agilent GCMS Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Introduction

This checklist covers the following model(s):

| Type | Model |
|------|-------------------|
| SQ | 5973 Series MSD |
| SQ | 5975 Series MSD |
| SQ | 5977 Series MSD |
| TQ | 7000 Series MS/MS |
| TQ | 7010 Series MS/MS |
| QTOF | 7200 Series QTOF |
| QTOF | 7250 Series QTOF |

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- To access Agilent training and education, visit <http://www.agilent.com/chem/training> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.

- To access the Agilent Resource Center web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The Agilent Community is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the Agilent YouTube channel at <https://www.youtube.com/user/agilent>
- Need to place a service call? Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Service not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Verification section
- Complete Signature Page and attach Signature Page to Service Order.

Additional Instruction Notes

- Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electromechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. Two preventative maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.

Instrument Maintenance

Select the appropriate service to be performed.

- ☐ Interim Preventive Maintenance (when available, is typically 6 months or at the request of the customer)
☒ Major Preventive Maintenance (Yearly)
☐ Enhanced Preventive Maintenance (when available, is provided "As needed")

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID

Instrument System Site and Location

SECOT, Bangkok

List System Component Product Numbers

List the Serial Numbers of each Component

 1.
2.
3.
4.
5.
6.
7.
8.
9.

G3172A

U513743B01

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the Instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware updates and verify with customers if they would like them installed. Firmware update(s) are strongly recommended.

Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables, and usage-dependent items such as gases, vials, syringes, calibrant solution and solvents required for successful preventive maintenance are available. A customer representative should be available while the preventive maintenance is being performed.

Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ☐ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

Note: It is recommended to have the customer run the autotune and tune evaluation prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

Definition of the Task/Recommended items within the document

| Task | | Recommended | | |
|------|----|-------------|-------|--|
| Yes | No | Interim | Major | As Needed |
| ✓ | | | | Yes selected means that the task was done or the part was required. |
| | ✓ | | | No selected means that the task was not done or the part was not required. |
| | | ✓ | | Interim selected means that this task is recommended to be done at 6-month intervals. |
| | | | ✓ | Major selected means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased. |
| | | | | ✓ As needed selected means that the task was done or the part was used as needed. For example, there could be two types of filters that could be used and this was the one selected. |

Preventive Maintenance Procedures

☐ Service Not Applicable

Interim / Major Preventive Maintenance – GCMS

| Yes/No | Interim/Major | Description |
|-------------------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Perform general inspection of system for cleanliness. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Discuss any problems the customer is having with the instrument. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Review customer maintenance records and exclude maintenance on recently serviced items. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution. |

Interim / Major Preventive Maintenance – System Checks

☐ Service Not Applicable

| Yes/No | Interim/Major | Description |
|-------------------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Verify that calibration peaks were seen prior to starting the PM. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Vent the instrument. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Inspect vacuum hoses, pump, exhaust tubing, and power cords for excessive wear. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Visually inspect calibrant levels – PFTBA PFOTD (if appl.), IRM (if appl.). Refill if available. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Look for any obvious external damage or problems. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Clean air intake(s). Cosmetic cover(s) may need to be removed. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Verify system line voltage meets instrument specifications: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | For HydroInert systems, verify customer is running hydrogen: Yes <input type="checkbox"/> No <input type="checkbox"/> |

Interim / Major Preventive Maintenance – Wet Mechanical vacuum pumps

☐ Service Not Applicable

| Yes/No | Interim/Major | Description |
|-------------------------------------|-------------------------------------|-----------------------------|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Wet Mechanical vacuum pumps |

| | | |
|-------------------------------------|-------------------------------------|--|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Check for evidence of oil leakage. Check pump gasket for leakage. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Drain and replace mechanical pump oil. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Replace Oil Mist Filter if applicable. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Discuss with customer the need for more frequent oil changes if the oil is dirty. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Don't use mist filters with Chemical Ionization. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. Visually confirm that no oil returns up vacuum hose. |

Interim / Major Preventive Maintenance – Dry Mechanical vacuum pumps - Diaphragm

☒ Service Not Applicable

| Yes/No | Interim/Major | Description |
|--------------------------|-------------------------------------|---|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Dry Mechanical vacuum pumps - Diaphragm |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Clear air flow paths of dust. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | If vacuum is poor, then replace the diaphragm pump. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. |

Interim / Major Preventive Maintenance – Dry Mechanical vacuum pumps - Scroll

☒ Service Not Applicable

| Yes/No | Interim/Major | Description |
|--------------------------|-------------------------------------|---|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Dry Mechanical vacuum pumps - Scroll |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Replace the tips seal on the IDP pump. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Replace the Exhaust Filter if required. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Discuss with customer the need for more frequent changes, if needed. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Inform customer that pump gas ballast should be installed all the time. |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. |

Interim / Major Preventive Maintenance – Cleaning System and Filters

☐ Service Not Applicable

| Cleaning System and Filters | | | |
|-------------------------------------|-------------------------------------|---|-------------------------------------|
| Yes/No | Interim/Major | Description | |
| | | Fans | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Remove dust from fans and vent covers. | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Verify fans are functional and that there is enough space around the instrument for proper cooling. | |
| | | Source cleaning (all sources except HydroInert) | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Open analyzer and remove the source. | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Disassemble, Clean, Re-assemble source. | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Re-install source and close analyzer. | |
| | | HydroInert Source | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | | Source NOT to be abrasively cleaned. No cleaning required at PM. If a decrease in performance is observed, recommend to the customer that filaments, insulators (repeller and lens stack), extractor lens, and repeller lens may need to be replaced to restore performance. HydroInert source should not be run with helium carrier. | |
| | | Filters | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Replace RMSH-2 Helium gas filter – if applicable. | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Replace RMSN-2 Nitrogen gas filter – if applicable. | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | Replace RMSHY-2 Hydrogen gas filter – if applicable. | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | CP17988 – Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount, and Filter – if applicable. | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | CP17974 – Gas Clean Filter Kit GC/MS 1/8"; Mount and Filter – if applicable. | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | CP17973 – Gas Clean Filter, Replacement Filter – if applicable. | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | S190-9071 – Methane Gas Filter – if applicable | |

Interim / Major Preventive Maintenance – System Post Check

☐ Service Not Applicable

| System post-check | | | |
|---|--------------------------|-------------------------------------|-------------------------------------|
| Yes/No | Interim/Major | Description | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Pump system back down. Wait until system stability has been achieved. | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Verify system vacuum reading(s) via the gauge controller. | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Leak Check | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Verify system in manual tune | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Compare against previous tune file report(s) | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Check manually that you have calibration peaks. | | | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| EI Autotune Performed | | | |

Guidance: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument setup and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☐ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete Signature Page and attach Signature Page to Service Order.

Test Results

| Test Description | Expected Test Result | Actual Test Result |
|------------------|----------------------|--------------------|
|------------------|----------------------|--------------------|

Consumed PM Parts

Common MS Filters and Seals – 5973/5975/5977/7000/7010/7200/7250 Series

| Part Description | Part Number | Interim | Major | As Needed |
|--|-------------|---------|-------|-----------|
| Helium gas filter – if required | RMSH-2 | | ✓ | ✓ |
| Nitrogen gas filter – if required | RMSN-2 | | ✓ | ✓ |
| Big Universal Trap, 1/8" fittings, Hydrogen, if required | RMSHY-2 | | ✓ | ✓ |
| Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount and Filter – if required | CP17988 | | ✓ | ✓ |
| Gas Clean Filter Kit GC/MS 1/8 in (complete replacement kit) – if required | CP17974 | | ✓ | ✓ |
| Gas Clean GS/MS Filter – if required | CP17973 | | ✓ | ✓ |
| Chemical Ionization Gas Purifier (CI systems) – if required | 5190-9071 | | ✓ | ✓ |
| Agilent AVF Platinum, 1 quart | 5191-5351 | ✓ | ✓ | |
| Gas filters need to be changed only if required | | | | |

MS Maintenance Supplies for 5973/5975/5977 Series

| Part Description | Part Number | Interim | Major | As Needed |
|--|-----------------|---------|-------|-----------|
| Diffusion pump fluid (Diffusion Pump Models) | 6040-0809 Qty 2 | ✓ | ✓ | ✓ |
| IDP-3 Tip Seal Replacement Kit (IDP-3 Dry Pump Models) | G7077-67018 | ✓ | ✓ | ✓ |
| IDP-3 Tip Seal Replacement Kit (no tools – CSD P/N) | 5190-9561 | ✓ | ✓ | ✓ |
| IDP-3 Tip Seal Replacement Kit (no tools – VPD P/N) | IDP3TS | ✓ | ✓ | ✓ |
| Filter element for IDP-3 | REPLSLRFILTER 2 | ✓ | ✓ | ✓ |
| DS42 Oil Mist Eliminator 3/4G & 3/8 | SR03706556 | ✓ | ✓ | ✓ |
| Exhaust oil mist trap (thread) Edwards/Pfeiffer | G1099-80039 | ✓ | ✓ | ✓ |
| Repeller Insulator | G1099-20133 | | | ✓ |
| Lens stack Insulator | G3870-20530 | | | ✓ |
| Lens Insulator for Extractor (ring Insulator) | G3870-20445 | | | ✓ |
| HydroInert Extractor lens (9mm) | G7078-20909 | | | ✓ |
| HydroInert Repeller | G7078-20902 | | | ✓ |

MS Maintenance Supplies for 7000/7010 Series

| Part Description | Part Number | Interim | Major | As Needed |
|---|-----------------|---------|-------|-----------|
| Nitrogen gas filter | RMSN-2 | | ✓ | ✓ |
| IDP-10 Tip Seal Replacement Kit (IDP-10 Dry Scroll Pump Models) | G7004-67023 | | ✓ | ✓ |
| IDP-10 Tip Seal Replacement Kit (no tools – VPD P/N) | X3807-67000 | | ✓ | ✓ |
| Oil Mist Filter RV5 | G6600-80043 | | ✓ | ✓ |
| Filter element for the IDP-10 | REPLSLRFILTER 1 | | ✓ | ✓ |
| Repeller Insulator | G1099-20133 | | | ✓ |
| Lens stack insulator | G3870-20530 | | | ✓ |
| Lens insulator for Extractor (ring insulator) | G3870-20445 | | | ✓ |
| Hydroinert Extractor lens (9mm) | G7078-20909 | | | ✓ |
| Hydroinert Repeller | G7078-20902 | | | ✓ |

MS Maintenance Supplies for 7200/7250 Series

| Part Description | Part Number | Interim | Major | As Needed |
|--|-----------------|---------|-------|-----------|
| Nitrogen gas filter -- if required | RMSN-2 | | ✓ | ✓ |
| RIS Probe Maintenance Kit (7200 Series only) | G7004-67023 | | ✓ | ✓ |
| DS202 Oil Mist Eliminator | X3807-67000 | | ✓ | ✓ |
| IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Pump Models) | G6600-80043 | | ✓ | ✓ |
| IDP-15 Tip Seal Replacement Kit (no tools – VPD P/N) | REPLSLRFILTER 1 | | ✓ | ✓ |
| Filter element for SH-110/SH-112/IDP-15 exhaust silencer | G1099-20133 | | ✓ | ✓ |
| DS 3/8 MAG. PLUG AND GASKET | G3870-20530 | | ✓ | ✓ |

MS Maintenance Supplies for JetClean

| Part Description | Part Number | Interim | Major | As Needed |
|--|-------------|---------|-------|-----------|
| Big Universal Trap, 1/8" fittings, Hydrogen, if required | RMSHY-2 | | ✓ | ✓ |

 Consumed Parts Reference
 (Purchased by customer, not included as part of PM)

Common MSD Maintenance Supplies 5973/5975/5977/7000/7010/7200/7250 Series

| Part Description | Part Number | Interim | Major | As Needed |
|---|-------------------|---------|-------|-----------|
| El High Temperature Filaments | G7005-60061 Qty 2 | | | ✓ |
| HES El Filaments | G7002-60001 | | | ✓ |
| LE-El Filaments | G3850-60021 | | | ✓ |
| CI High Temperature Filament – all MSDs | G7005-60072 | | | ✓ |
| PFTBA GCMS Tuning Standard calibrant | G5971-60571 | | | ✓ |
| PFTD calibrant, 1 mL | 8500-8510 | | | ✓ |
| PFET, IRM calibrant for GC QTOF 0.5 mL | 5190-0531 | | | ✓ |

MSD Maintenance Supplies 5973/5975/5977 Series

| Part Description | Part Number | Interim | Major | As Needed |
|---|-------------------|---------|-------|-----------|
| CI Interface tip seal (tip and spring combo) | G1999-60412 | | | ✓ |
| CI Interface tip seal (tip only) | G3870-20542 | | | ✓ |
| CI Interface tip seal spring (spring only) | G1999-20023 | | | ✓ |
| Repeller insulator | G1099-20133 Qty 2 | | | ✓ |
| Lens insulator/holder (HES) | G7002-20074 | | | ✓ |
| Ring heater/sensor assembly (HES) | G7002-60043 | | | ✓ |
| Ceramic insulator for Extractor (HES) | G7002-20064 | | | ✓ |
| Transfer-Line Tip Cap, Threaded | G3870-20547 | | | ✓ |
| Transfer-Line Tip Base, Threaded | G3870-20548 | | | ✓ |
| Lens stack insulator | G3870-20530 | | | ✓ |
| Lens insulator for Extractor (ring insulator) | G3870-20445 | | | ✓ |
| Hydroinert Extractor lens (9mm) | G7078-20909 | | | ✓ |
| Hydroinert Repeller | G7078-20902 | | | ✓ |

MS Maintenance Supplies for 7000/7010 Series

| Part Description | Part Number | Interim | Major | As Needed |
|---|-------------------|---------|-------|-----------|
| CI Interface tip seal - 7000 | G1999-60412 | | | ✓ |
| CI Interface tip seal - 7010 | G7002-60412 | | | ✓ |
| CI Interface tip seal (tip only) | G3870-20542 | | | ✓ |
| CI Interface tip seal spring (spring only) | G1999-20023 | | | ✓ |
| Repeller insulator - 7000 | G1099-20133 Qty 2 | | | ✓ |
| Lens insulator/holder (HES) | G7002-20074 | | | ✓ |
| Ring heater/sensor assembly (HES) | G7002-60043 | | | ✓ |
| Ceramic insulator for Extractor (HES) | G7002-20064 | | | ✓ |
| Transfer-Line Tip Cap, Threaded | G3870-20547 | | | ✓ |
| Transfer-Line Tip Base, Threaded | G3870-20548 | | | ✓ |
| Lens stack insulator | G3870-20530 | | | ✓ |
| Lens insulator for Extractor (ring insulator) | G3870-20445 | | | ✓ |
| HydroInert Extractor lens (9mm) | G7078-20909 | | | ✓ |
| HydroInert Repeller | G7078-20902 | | | ✓ |

MS Maintenance Supplies for 7200 Series

| Part Description | Part Number | Interim | Major | As Needed |
|-----------------------------|-------------|---------|-------|-----------|
| Extractor Lens Insulator | G7005-20133 | | | ✓ |
| Ion Focus Insulator | G7005-20442 | | | ✓ |
| Ring Heater/Sensor Assembly | G7005-60110 | | | ✓ |
| RIS Xfer Tip | G7005-20542 | | | ✓ |
| RIS Xfer Tip Spring | G7005-20024 | | | ✓ |

MS Maintenance Supplies for 7250 Series

| Part Description | Part Number | Interim | Major | As Needed |
|---------------------------------------|-------------|---------|-------|-----------|
| Lens insulator/holder (HES) | G7002-20074 | | | ✓ |
| Ring heater/sensor assembly (HES) | G7002-60043 | | | ✓ |
| Ceramic insulator for Extractor (HES) | G7002-20064 | | | ✓ |
| Transfer-Line Tip Cap, Threaded | G3870-20547 | | | ✓ |

| Part Description | Part Number | Interim | Major | As Needed |
|----------------------------------|-------------|---------|-------|-----------|
| Transfer-Line Tip Base, Threaded | G3870-20548 | | | ✓ |
| EI Extractor Transfer Tip | G3870-20542 | | | ✓ |
| CI Tip Compression Spring | G1999-20023 | | | ✓ |

MS Maintenance Supplies for Intuvo 9000 MS Series

| Part Description | Part Number | Interim | Major | As Needed |
|---------------------------------|-------------|---------|-------|-----------|
| Swaged MS Tail - Packaged | G4590-60009 | | | ✓ |
| Swaged MS Tail (HES) - Packaged | G4590-60109 | | | ✓ |

Common MS Maintenance Supplies

| Part Description | Part Number | Interim | Major | As Needed |
|-------------------------------|-------------|---------|-------|-----------|
| Abrasive paper, 30 um | 5061-5895 | | | ✓ |
| Alumina powder | 393706201 | | | ✓ |
| Cloths, clean (pkg of 15) | 05980-60051 | | | ✓ |
| Cloths, cleaning (pkg of 300) | 9310-4828 | | | ✓ |
| Cotton swabs (pkg of 100) | 5080-5400 | | | ✓ |
| Gloves, clean, large | 8650-0030 | | | ✓ |
| Gloves, clean, small | 8650-0029 | | | ✓ |

Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service review or other items of interest for the customer, please write in this box.

Service Verification

Service Request Number: 6005830693

Date of Service Completion: 22 Feb 2023

Service Engineer Name: SMV N.

Customer Name:

Service Engineer Signature:

Total number of pages in this document:

Teledyne Tekmar ATOMX Purge and Trap Preventive Maintenance Checklist - Standard

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

For more information about Agilent Technologies services please visit our web site using the following URL: <http://www.chem.agilent.com/en-us/products/services/pages/default.aspx>

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.

Teledyne Tekmar ATOMX Purge and Trap
Preventive Maintenance Checklist - Standard



System Information

Guidance

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

| | |
|---------------------------------------|---|
| Instrument system name and ID | |
| Instrument system site and location | SECOT, Bangkok |
| List system component product numbers | List the serial numbers of each component |
| 1. THR-ATOMX | 1. 0513241002 |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |
| 5. | 5. |
| 6. | 6. |
| 7. | 7. |
| 8. | 8. |
| 9. | 9. |
| 10. | 10. |

Preparation

- ☒ Discuss any specific issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform general inspection of system for cleanliness
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc
- ☒ Check for required firmware updates and verify with customers if they would like it installed.

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Teledyne Tekmar ATOMX Purge and Trap
Preventive Maintenance Checklist - Standard



Check External Supplies

- ☐ Section NOT Applicable
- ☒ Verify the gas source is supplying an input pressure of 50 - 100 psi to the ATOMX. If the customer is using a gas cylinder, verify the cylinder is at 500+ psi.
- ☒ Verify that the waste container has sufficient volume to contain the waste generated. Empty if necessary.
- ☒ Replace the DI water supply with fresh DI water.
 - ☐ Make sure the DI water supply is sufficient for sample analysis (1 Liter minimum)
- ☒ Make sure the methanol supply is sufficient for sample analysis.

Atomx Leak and Pressure Check

- ☐ Section NOT Applicable
- ☒ Scan through the sample log to verify that the purge pressures are staying consistent throughout the daily runs.
- ☒ Use the Teldink software to check the standard pressure.
- ☒ Run a leak check to ensure that the unit is leak tight.

Inspect ATOMX Hardware

- ☐ Section NOT Applicable
- ☒ Check the tray vial holes for foreign particles. Clean if necessary.
- ☒ Inspect the needle for particles or sample build up. Clean if necessary.
- ☒ Inspect the sparger glassware for damage and/or discoloration that could restrict flow or cause contamination. Replace if necessary.
- ☒ Inspect the drain tubing for clogging. Replace the drain line if necessary.
- ☒ Lubricate the ATOMX Carousel Drive. Refer to the diagram on page 6-25 of the ATOMX User Manual for lubrication points. Teledyne Tekmar recommends using DuPont Krytox lubrication.
- ☒ Lubricate the ATOMX Elevator. Refer to the diagram on page 6-32 of the ATOMX User Manual for lubrication points. Teledyne Tekmar recommends using DuPont Krytox lubrication.

Restore Instrument

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

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Teledyne Tekmar ATOMX Purge and Trap
Preventive Maintenance Checklist - Standard



Service Review

- ☐ Attach available reports/printouts of all tests to this documentation.
- ☐ Record the PM service activity in the customer's instrument records/logbook
- ☐ Update/reset instrument maintenance counters as appropriate
- ☐ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☐ Complete the Service Engineer Comments section below if there are additional comments
- ☐ Review the service and any test results with the customer.
- ☐ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

Product or Product Type Test Results Table

| Test Description | Expected Test Result | Actual Test Result |
|------------------|----------------------|--------------------|
| Leak Test | Pass | Pass |

Product or Product Type Parts List Table

| Part Description | Part Number | Product or Model# where used | Quantity Consumed |
|--------------------------------|--|------------------------------|-------------------|
| Sparger Glassware | Ask the customer what size sparger glassware they are using; refer to the ATOMX parts list for part numbers. | TMR-ATOMX | 1 |
| Lubricant, Dupont Krytox | 15-0293-000 | TMR-ATOMX | 1 |
| Tubing, Drain, Self Retracting | 15-0087-002 | TMR-ATOMX | 1 |

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Preventive Maintenance Checklist - Standard



Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write in this box.

Other Important Customer Web Links

- ☐ How to get information on your product: Literature Library - <http://www.agilent.com/chem/library>
- ☐ Need to know more? - www.agilent.com/chem/education
- ☐ Need technical support, FAQs? - www.agilent.com/chem/techsupport
- ☐ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number 6005830813 Date service completed 22 Feb 2023

Agilent signature [Signature] Customer signature [Signature]

Number of pages in this document

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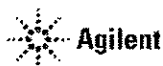
Agilent CrossLab Start Up Services

Agilent 7890 Gas Chromatograph

Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the preventive maintenance activities.



Agilent 7890 GC Preventive Maintenance Checklist



Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- For more information about **Agilent Technologies services**, please visit our website using the following URL: <http://www.agilent.com/en-us/products/crosslab-instrument-services/service-repair>
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- A useful **Agilent Resource Center** web page is available, which includes short videos on maintenance, quick lists of consumables for new instruments, and other valuable information. Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>.
- Need technical support, FAQs, supplies? – visit our **Support Home page** <http://www.agilent.com/search/support>.
- **Videos** about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **7890B Manuals** are also available on Agilent.com:
 - o **Safety**
https://www.agilent.com/cs/library/usermanuals/public/7890B_Safety.pdf
 - o **Installation and First Startup**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Installation.pdf
 - o **Operation Manual**
https://www.agilent.com/cs/library/usermanuals/Public/7890B_Operation.pdf
 - o **Maintaining Your GC**
https://www.agilent.com/cs/library/usermanuals/public/G3430-90952%207890B_Maintaining%20Guide.pdf

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service.
- Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

System Information

- ☒ Check this box if an instrument configuration report is attached instead of completing the table below.

Instrument System Name and ID
 Instrument System Site and Location

GC7890B CN15343147
 Secot Co., Ltd. Instrument room.

List System Component Product Numbers

List the Serial Numbers of each Component

1. G3440B
 2. G4513A
 3. G4514A

CN15343147
 CN1910080
 CN19080006

4.
 5.
 6.
 7.
 8.
 9.
 10.

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components, settings as defined by current Service Notes.
- ☒ Check for required firmware updates and verify with customers if they would like them installed.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

Preventive Maintenance Procedure

Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the Inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 7890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ Replace the split vent trap cartridge filter on units with these inlets: Split/Splitless Capillary (SSL), Multi-Mode Inlet (MMI), Programmed Temperature Vaporizer (PTV), Volatiles Interface (VI).
- ☒ If the inlet system is used in Split Mode with viscous samples, inspect and clean the split vent tube on the inlet and flush or replace the tubing between the inlet and the split vent trap.
- ☒ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any buildup of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 7890 "Advanced User Guide".
- ☒ Perform inlet pressure decay test(s) as defined in the 7890 "Troubleshooting Manual".
If the PM is done in preparation for an Operational Qualification, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☐ Section NOT applicable
- ☒ Check all cabling and configuration settings between GC, tray, and injectors.
- ☒ Vacuum or remove any dust, especially around fans.
- ☒ Check operation of all fans.
- ☒ Check syringe for smooth plunger operation.
- ☒ Check for smooth operation of the needle support – clean if necessary

Restore Instrument

- ☒ Restore the normal operating conditions or customer method using the Data System.
- ☒ Purge the system with carrier flow for 15 minutes
- ☒ Bake out the system, then restore the normal operating conditions
- ☒ After equilibration, check and record the post PM detector signal output values.
Results should be similar or lower than the detector outputs recorded prior to PM.
- ☐ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Note: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

Signature Page

Service Review

- ☐ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review with the customer this service, parts replaced, and test results obtained.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.
- ☐ Supply the customer with a copy of the Smart Alerts flyer.
- ☐ Describe Smart Alerts to the customer.
- ☐ Install Smart Alerts if requested.

7890 GC Test Results Table

| Detector Signal Outputs | Before PM Service | After PM Service |
|----------------------------------|----------------------|--------------------|
| Front detector output <i>MSD</i> | <i>N/A</i> | <i>126.2</i> |
| Back detector output <i>FID</i> | <i>N/A</i> | <i>22.6</i> |
| AUX detector output | <i>N/A</i> | <i>N/A</i> |
| Pressure decay test | Expected test result | Actual test result |
| Front inlet pressure decay test | Pass | <i>Pass</i> |
| Back inlet pressure decay test | Pass | <i>Pass</i> |

7890 Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

| Part description | Part number | Product or model# where used | Quantity consumed |
|--|-------------|------------------------------|-------------------|
| SSL Capillary Inlet PM kit, Splitless | 5188-6497 | 7890A/B | <i>N/A</i> |
| SSL Capillary Inlet PM kit, split | 5188-6496 | 7890A/B | <i>2</i> |
| SSL Capillary Ultra Inert Inlet Gold Seal with Washer | 5190-6144 | 7890A/B | <i>N/A</i> |
| SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool | 5190-2293 | 7890A/B | <i>N/A</i> |
| SSL Capillary Ultra Inert Inlet Low Pressure Drop Split Liner - with Glass Wool | 5190-2295 | 7890A/B | <i>N/A</i> |
| PP Inlet PM kit | 5188-6498 | 7890A/B | <i>N/A</i> |
| Split vent trap PM kit, single cartridge (for MMI, PTV & VI) | 5188-6495 | 7890A/B | <i>N/A</i> |
| MMI Cleaning Kit | G3510-60820 | 7890A/B | <i>N/A</i> |
| PTV Septumless Head Rebuild Kit | 5182-9747 | 7890A/B | <i>N/A</i> |
| PTV Septumless Head Teflon Guide | 5182-9748 | 7890A/B | <i>N/A</i> |
| Ignitor (glow plug) assembly with O-ring | 19231-60680 | 7890A/B | <i>1</i> |
| FID Collector Rebuild/Cleaning Kit | G1531-67000 | 7890A/B | <i>N/A</i> |
| Standard .011-inch FID Jet for capillary FID base | G1531-80560 | 7890A/B | <i>1</i> |
| High Temperature .018-inch FID Jet for capillary FID base | G1531-80620 | 7890A/B | <i>N/A</i> |
| Standard .018-inch FID Jet for packed column with packed FID base | 18710-20119 | 7890A/B | <i>N/A</i> |
| Standard .011-inch FID Jet for capillary column with packed/adaptable FID base | 19244-80560 | 7890A/B | <i>N/A</i> |
| High Temperature .018-inch FID Jet for capillary column with packed/adaptable FID base | 19244-80620 | 7890A/B | <i>N/A</i> |
| NPD Jet, universal fit, .011-inch ID | G1534-80590 | 7890A/B | <i>N/A</i> |
| NPD Jet, universal fit, .011-inch ID Extended tip | G1534-80590 | 7890A/B | <i>N/A</i> |
| SSL Capillary Ultra Inert Inlet Gold Seal with Washer | 5190-6144 | 7890A/B | <i>N/A</i> |
| SSL Capillary Ultra Inert Inlet Splitless Liner - Single taper with Glass Wool | 5190-2293 | 7890A/B | <i>N/A</i> |
| **FID Collector Replacement Kit, if needed | G1531-67001 | 7890A/B | <i>N/A</i> |

Service Engineer Comments

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write include them in this box.

Service Completion

Service request number

60064153

Agilent signature

[Signature]

Total number of pages in this document

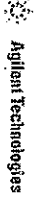
9 pages

Date service completed

29 May 2013

Customer signature

[Signature]



Certificate of Completion

Learner Name:

Saenguthai Saeng Tark

Title Of Course:

AN-ASP/CE/CSE-GC-1-001-Mt: 7890/7820 GC and OL GC Standalone Chemstation I&E/ Service

Completion Date:

November 23, 2014

Certified By Company:

Learning at Agilent

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

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Certificate of Completion

| | |
|-----------------------|---|
| Learner Name: | Saenguthai Saeng Tarak |
| Title Of Course: | AN-CE-GC-IL-022-A: Advanced GC Detectors Application and Troubleshooting Labs |
| Completion Date: | November 25, 2014 |
| Certified By Company: | Learning at Agilent |

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

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 Notes, internal technical updates, update training, current documentation, technical support, current 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.

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Agilent CrossLab Compliance Services

Document Name:

Operator's training certificate and qualifications

Agilent Technologies

Certificate of Completion

Learner Name:

Saenguthai Tarak

Title Of Course:

AN-CE-GC-MS-2-041-D-5977 EIC-CHARIS MSD GC-MS OPER. HW S/W – Intro, Repair and Troubleshooting

Completion Date:

March 18, 2016

Certified By Company:

Learning at Agilent

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 Notes, internal technical updates, update training, current documentation, technical support, current 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.

Calibration Certificate

Certificate No.: 2304081-003-01
Client name: SECOT CO., LTD.
Address: 239 Rimklongprapa Road,
Bangsue, Bangsue, Bangkok 10800

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)
Manufacturer: BINDER
Model: ED 53
Serial No.: 01-27152
ID No.: N/A
Order No.: 2304081
Operation No.: 2304081-003
Date of Receipt: 27 July 2023
Date of Calibration: 27 July 2023

Calibrated by Mr.Worapob Sooktong
Scientist

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 7 August 2023

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.



Calibration Report

Certificate No.: 2304081-003-01
Equipment: CHAMBER (Hot Air Oven)
Model: ED 53 **Serial No.:** 01-27152
Resolution: 1 °C **ID No.:** N/A
Manufacturer: BINDER
Date of Calibration: 27 July 2023

Page 2 of 3

Location: Laboratory, SECOT CO., LTD.
Environment Condition: Ambient Temperature (32 ± 1) °C
Relative Humidity (52 ± 2) %
Line Voltage (228 ± 1) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used was based on ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

| Instrument | Model | Serial No./ID No. | Certificate No. | Due Date | Through |
|---------------------------------|--------|-------------------------|-----------------|---------------|-------------------------|
| Digital Thermometer with sensor | 34972A | MY49016894 | TE 660380-01 | 22 April 2024 | NATIONAL FOOD INSTITUTE |
| | RTD | CH#101-109/ RTD#101-109 | | | |

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC Description :

Time of Record 1 Hour 9 Minute At 104, 110 and 180 °C
Fresh air Damper ☐ Open Position ☐
☒ Close
☐ Not Available

- Result of Calibration : ☒ Without adjustment ☐ After adjustment



Calibration Report

Certificate No.: 2304081-003-01
Equipment: CHAMBER (Hot Air Oven)
Model: ED 53 Serial No.: 01-27152
Resolution: 1 °C ID No.: N/A
Manufacturer: BINDER

Date of Calibration: 27 July 2023
Calibration point: 104, 110 and 180 °C

| Calibration Condition | Temperature (°C) | Relative Humidity (%) | Line Voltage (Volt) |
|-----------------------|------------------|-----------------------|---------------------|
| MIN | 31.7 | 50.3 | 227.1 |
| MAX | 32.7 | 53.5 | 228.5 |

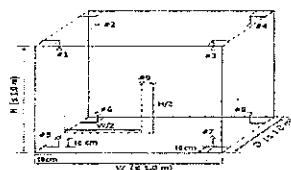


Table 1 : Reporting of Temperature

| Calibration point (°C) | Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF) | | | | | | | | | Uncertainty ± (°C) |
|------------------------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|
| | # 1 | # 2 | # 3 | # 4 | # 5 | # 6 | # 7 | # 8 | # 9 | |
| 104 | 104.79 | 105.05 | 104.60 | 104.30 | 104.35 | 103.88 | 104.29 | 103.87 | 103.82 | 0.78 |
| 110 | 111.06 | 111.10 | 110.65 | 110.38 | 110.01 | 109.70 | 109.80 | 109.76 | 109.80 | 0.80 |
| 180 | 181.06 | 181.08 | 180.58 | 180.53 | 180.43 | 180.25 | 179.97 | 180.71 | 180.08 | 0.90 |

Table 2 : Reporting of Characterization Result

| UUC* Setting (°C) | UUC* reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall Variation (°C) |
|-------------------|-------------------|-----|---------|------------------|-----------------|------------------------|
| | MIN | MAX | Average | | | |
| 104 | 104 | 104 | 104 | 0.22 | 1.23 | 1.55 |
| 110 | 110 | 110 | 110 | 0.25 | 1.30 | 1.80 |
| 177 | 177 | 177 | 177 | 0.32 | 0.99 | 1.54 |

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----



Calibration Certificate

Certificate No.: 2303092-001-01
Client name: SECOT CO., LTD.
Address: 239 Rimklongprapa Road, Bangsue, Bangsue, Bangkok 10800

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)

Manufacturer: MEMMERT

Model: UF 55

Serial No.: B213.0295

ID No.: N/A

Order No.: 2303092

Operation No.: 2303092-001

Date of Receipt: 26 May 2023

Date of Calibration: 26 May 2023

Calibrated by Mr.Jerawut Prapawuttipong
Scientist

Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 30 May 2023

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.



Calibration Report

Certificate No.: 2303092-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF 55 Serial No.: B213.0295
Resolution: 0.1 °C ID No.: N/A
Manufacturer: MEMMERT
Date of Calibration: 26 May 2023

Page 2 of 3

Location: Walkway Laboratory, SECOT CO., LTD.
Environment Condition: Ambient Temperature (30.5 ± 1) °C
Relative Humidity (60 ± 5) %
Line Voltage (220 ± 5) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used was based on ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

| Instrument | Model | Serial No./ID No. | Certificate No. | Due Date | Through |
|---------------------------------|--------|-------------------------|-----------------|------------|-------------------------|
| Digital Thermometer with sensor | 34972A | MY49016851 | TE 660495-01 | 7 May 2024 | NATIONAL FOOD INSTITUTE |
| | RTD | CH#201-209/ RTD#201-209 | | | |

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.

6. Condition of Calibrated item : Good

UUC Description :

Time of Record 1 Hour 9 Minute At 80.0, 104.0 and 180.0 °C
Fresh air Damper ☐ Open Position ☐
☒ Close Fan 80%
☐ Not Available

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment



Calibration Report

Certificate No.: 2303092-001-01
Equipment: CHAMBER (Hot Air Oven)
Model: UF 55 Serial No.: B213.0295
Resolution: 0.1 °C ID No.: N/A
Manufacturer: MEMMERT
Date of Calibration: 26 May 2023

Page 3 of 3

Calibration point: 80.0, 104.0 and 180.0 °C

Calibration result:

| Calibration Condition | Temperature (°C) | Relative Humidity (%) | Line Voltage (Volt) |
|-----------------------|------------------|-----------------------|---------------------|
| MIN | 30.0 | 55 | 215.0 |
| MAX | 31.0 | 65 | 225.0 |

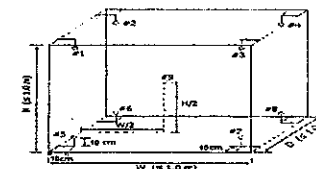


Table1 : Reporting of Temperature

| Calibration point (°C) | Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF) | | | | | | | | | Uncertainty ± (°C) |
|------------------------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|
| | # 1 | # 2 | # 3 | # 4 | # 5 | # 6 | # 7 | # 8 | # 9 | |
| 80.0 | 80.00 | 80.08 | 79.98 | 80.01 | 80.11 | 80.00 | 79.89 | 80.02 | 80.12 | 0.16 |
| 104.0 | 104.05 | 104.03 | 104.19 | 104.09 | 104.06 | 104.10 | 103.89 | 104.17 | 104.29 | 0.53 |
| 180.0 | 179.88 | 180.12 | 180.02 | 180.20 | 180.27 | 180.36 | 179.93 | 180.04 | 180.11 | 0.90 |

Table 2 : Reporting of Characterization Result

| UUC* Setting (°C) | UUC* Reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall Variation (°C) |
|-------------------|-------------------|-------|---------|------------------|-----------------|------------------------|
| | MIN | MAX | Average | | | |
| 80.0 | 80.0 | 80.0 | 80.0 | 0.077 | 0.23 | 0.33 |
| 104.0 | 104.0 | 104.0 | 104.0 | 0.094 | 0.40 | 0.51 |
| 180.0 | 180.0 | 180.0 | 180.0 | 0.17 | 0.26 | 0.77 |

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

----- End -----




Calibration Certificate

Certificate No.: 2304081-002-01
Client name: SECOT CO., LTD.
Address: 239 Rimklongprapa Road,
Bangsue, Bangsue, Bangkok 10800

Page 1 of 3

Equipment: Water Bath
Manufacturer: MEMMERT
Model: WB 29
Serial No.: I698.0051
ID No.: N/A
Order No.: 2304081
Operation No.: 2304081-002
Date of Receipt: 27 July 2023
Date of Calibration: 27 July 2023

Calibrated by Mr.Worapob Sooktong
Scientist

Approved by 
(Mr.Pheraphat Tuanjit)

Manager, Division of Calibration Laboratory

Date of Issue: 7 August 2023 **Responsible for the Technical Management Team**

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 standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2304081-002-01
Equipment: Water Bath
Model: WB 29 Serial No.: I698.0051
Resolution: 0.1 °C ID No.: N/A
Manufacturer: MEMMERT

Date of Calibration: 27 July 2023

Page 2 of 3

Location: Laboratory, SECOT CO., LTD.
Environment Condition: Ambient Temperature (24 ± 1) °C
Relative Humidity (58 ± 2) %
Line Voltage (229 ± 1) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 5 standard thermometer into its liquid bath and calibration according to W-TE-011 based on ASTM E715-80 (2016): Standard Specification for Gravity-Convection and Forced-Circulation Water Baths.
- The temperature scale used is ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

| Instrument | Model | Serial No./ID No. | Certificate No. | Due Date | Through |
|---------------------------------|--------|--------------------------|-----------------|---------------|-------------------------|
| Digital Thermometer with sensor | 34972A | MY49016894 | TE 660380-01 | 22 April 2024 | NATIONAL FOOD INSTITUTE |
| | RTD | RTD#201-205 / CH#201-205 | | | |

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good
UUC Description:

Time of Record 1 Hour 9 Minute At 95.0 °C

- Result of Calibration : ☒ Without adjustment
☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

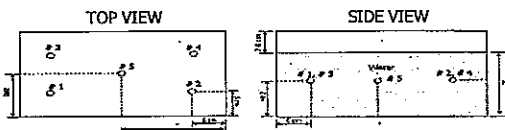


Calibration Report

Certificate No.: 2304081-002-01
Equipment: Water Bath
 Model: WB 29 Serial No.: I698.0051
 Resolution: 0.1 °C ID No.: N/A
 Manufacturer: MEMMERT
Date of Calibration: 27 July 2023 Page 3 of 3

Calibration point: 95.0 °C
Calibration result:

| Calibration Condition | Temperature (°C) | Relative Humidity (%) | Line Voltage (Volt) |
|-----------------------|------------------|-----------------------|---------------------|
| Min | 23.0 | 56.3 | 227.5 |
| Max | 25.0 | 60.2 | 229.6 |



Sensor Installation Location

Table 1 : Reporting of Temperature

| Calibration Point (°C) | Measured Temperature (°C) @ Sensor No. (Sensor No.5 is REF) | | | | | Uncertainty ± (°C) |
|------------------------|---|-------|-------|-------|-------|--------------------|
| | # 1 | # 2 | # 3 | # 4 | # 5 | |
| 95.0 | 95.03 | 94.96 | 95.10 | 94.97 | 95.02 | 0.28 |

Table 2 : Reporting of Characterization Result

| UUC* Setting (°C) | UUC* reading (°C) | | | Stability ± (°C) | Uniformity (°C) | Overall Variation (°C) |
|-------------------|-------------------|------|---------|------------------|-----------------|------------------------|
| | MIN | MAX | Average | | | |
| 95.0 | 94.9 | 95.1 | 95.0 | 0.18 | 0.080 | 0.47 |

Note The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity)"
 UUC* = Unit Under Calibration
 Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
 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.
 Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.
 The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k= 2, providing a level of confidence of approximately 95 %.

----- End -----



ภาคผนวก จ

หนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
จากกรมโรงงานอุตสาหกรรม



ที่ อก ๐๓๑๐(๑)/ ๑๑ ๐ ๑ ๖

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๕๐๐

๒๐ กรกฎาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ซีคอต จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๗ เมษายน ๒๕๖๖

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๑ แผ่น
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๔ แผ่น

ตามหนังสือที่อ้างถึง บริษัท ซีคอต จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๒๓๙ สถานที่ตั้งเลขที่ ๒๓๙ ถนนริมคลองประปา แขวงบางซื่อ เขตบางซื่อ กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ซีคอต จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๘ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูล หรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ พฤษภาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อม กรมโรงงานอุตสาหกรรมภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายประสม ดำรงพงษ์)

ผู้อำนวยการกองวิจัยและเฝ้าระวังมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเฝ้าระวังมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@div.mail.go.th



อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว



ส่งส่งมาด้วย ๑

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ซีคอต จำกัด

เลขทะเบียน ๖-๒๓๙

ที่ อก ๐๓๑๐(๑)/ ๑๑ ๐ ๑ ๖

ลงวันที่ ๒๐ กรกฎาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑๐ ราย

๑) นายขรรชัย เกรียงไกรอุดม

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๒

๒) นางสมฤดี เกรียงไกรอุดม

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๓

๓) นางอารยา ทิพย์รักษ์

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๔

๔) นางสาวเชมชูลา อินทร์ศรี

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๕

๕) นางสาวปริดา สมใจ

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๖

๖) นางสาวอริยญา มาดา

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๗

๗) นางสาวลดาวัลย์ วงศ์เจริญ

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๘

๘) นางสาวณัฏฐา เกตุวันดี

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๐๙

๙) นางสาววิสา ภูวสรเพ็ชญ์

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๑๐

๑๐) นางสาวศิริวรรณ อิมสง่า

ทะเบียนเลขที่ ๖-๒๓๙-ก-๐๐๑๑

วิภา

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ซีคอฟ จำกัด

เลขทะเบียน ว-๒๓๙

ที่ อก ๐๓๑๐(๑)/ ๑๑ ๐ ๑ ๖

ลงวันที่ ๒๐ กรกฎาคม ๒๕๖๖

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๘ ราย

- ๑) นางสาวสุดาพร สุนทร
- ๒) นางสาวสุภาทิพย์ เทียนเตี้ย
- ๓) นางสาวสุนันทา ศิริพัฒนานนท์
- ๔) นายบรร ดิษฐ์ยะ
- ๕) นางสาวเกศรินทร์ วรเดโชวิทยา
- ๖) นายอนิวัฒน์ พิมพ์นา
- ๗) นายชิตพล สมประสงค์
- ๘) นางสาวศศิธร พรหมประเสริฐ
- ๙) นายศิวะนนท์ กลวงษ์
- ๑๐) นางสาวอสิชา คณิรวานนท์
- ๑๑) นางสาวสิริวรรณ แก้วชิงดวง
- ๑๒) นางสาวปัทมวรรณ สุวรรณวิโรจน์
- ๑๓) นางสาวกนิษฐา เจริญเชื้อ
- ๑๔) นายวัชรกานต์ ประมาตะเด
- ๑๕) นายซอง เสงฆ์วัลกุล
- ๑๖) นางสาวกฤษณา จันทุม
- ๑๗) นางสาวพรนภา บุตรธรรม
- ๑๘) นางสาวธาริณี อาจปลิว
- ๑๙) นายธนโชติ ช่างล้อ
- ๒๐) นางสาวพัชรา สมานฉันท
- ๒๑) นางสาวจุฑารัตน์ แจ่มเรือน
- ๒๒) นางสาวจณิสตา กุ้ยอ่อน
- ๒๓) นายกิตติพงศ์ เกะเกิงสุข
- ๒๔) นายจิรวัฒน์ โคตรคำหาญ
- ๒๕) นายชนะพล อัครผล
- ๒๖) นางสาวทิพย์สุดา วรรณการ
- ๒๗) นายสิทธิชัย สว่างวงศ์ไชย
- ๒๘) นายพิษณุ สีนามเพ็ง
- ๒๙) นายรัตนชัย ขอบทำกิจ
- ๓๐) นายธนาวุฒิ ด่วนแสง
- ๓๑) นายณัฐชัย ไชยโคตร
- ๓๒) นายณัฐดนัย กฤษณะโสม
- ๓๓) นายศุภชัย สุขใหม่
- ๓๔) นายรอมกอน เหลี่ยมหมาด
- ๓๕) นางสาวสุภาวดี บัวแก้ว
- ๓๖) นางสาวมรียาณี ฮาแว
- ๓๗) นางสาววิระยา ปังนิมบุรณ์
- ๓๘) นางสาวศลิษา อินทรีย์

- ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๐๑
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๐๓
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๐๔
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๐๕
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ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๐๗
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ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๒๑
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๒๒
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๒๓
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ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๒๗
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๒๘
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๒๙
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๐
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ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๓
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๔
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ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๖
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๗
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๘
ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๙

31/7/2566

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ซีคอฟ จำกัด

เลขทะเบียน ว-๒๓๙

ที่ อก ๐๓๑๐(๑)/ ๑๑ ๐ ๑ ๖

ลงวันที่ ๒๐ กรกฎาคม ๒๕๖๖

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๕๕ รายการ

น้ำเสีย จำนวน 45 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------|---|
| 1 | Aldrin | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 2 | Arsenic | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4] |
| 3 | Barium | 1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4] |
| 4 | α-BHC | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 5 | β-BHC | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 6 | δ-BHC | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 7 | γ-BHC | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |

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| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---------------------------|--|
| 8 | Biochemical Oxygen Demand | 1) 5-Day BOD Test, Azide Modification Method ^[4] 2) 5-Day BOD Test, Membrane Electrode Method ^[4] |
| 9 | Cadmium | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4] |
| 10 | Chemical Oxygen Demand | 1) Open Reflux, Titrimetric method ^[4] 2) Closed Reflux, Colorimetric method ^[4] 3) Closed Reflux, Titrimetric Method ^[4] |
| 11 | Chlordane | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 12 | Chromium | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4] |
| 13 | Color | ADMI Weighted-Ordinate Spectrophotometric Method ^[4] |
| 14 | Copper | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4] |
| 15 | Cyanide | Distillation, Colorimetric method ^[4] |
| 16 | 4,4'-DDD | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|--------------------|---|
| 17 | 4,4'-DDE | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 18 | 4,4'-DDT | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 19 | Dieldrin | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 20 | Endosulfan I | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 21 | Endosulfan II | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 22 | Endosulfan Sulfate | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 23 | Endrin | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 24 | Endrin Aldehyde | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---------------------|--|
| 25 | Formaldehyde | Distillation, Colorimetric Method ^[9] |
| 26 | Free Chlorine | 1) Iodometric Method ^[4] 2) DPD Colorimetric Method ^[4] |
| 27 | Heptachlor | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass-Spectrometric Method ^[4] |
| 28 | Heptachlor epoxide | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 29 | Hexavalent Chromium | 1) Colorimetric Method ^[4] 2) Extraction, Air-Acetylene Flame Method ^[4] |
| 30 | Lead | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4] |
| 31 | Manganese | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4] |
| 32 | Mercury | Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4] |
| 33 | Methoxychlor | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4] |
| 34 | Nickel | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] <i>3mg/l</i> |

3) Digestion...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|-------------------------|--|
| | | 3) Digestion, Inductively Coupled Plasma Method ^[4] |
| 35 | Oil & Grease | 1) Liquid-Liquid, Partition-Gravimetric Method ^[4] 2) Soxhlet Extraction Method ^[4] |
| 36 | pH | Electrometric Method ^[4] |
| 37 | Phenols | 1) Distillation, Chloroform Extraction Method ^[4] 2) Distillation, Direct Photometric Method ^[4] |
| 38 | Selenium | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4] |
| 39 | Sulfide | 1) Iodometric method ^[4] 2) Methylene blue method ^[4] |
| 40 | Temperature | Laboratory and Field Methods ^[4] |
| 41 | Total Dissolved Solids | Dried at 180 °C ^[4] |
| 42 | Total Kjeldahl Nitrogen | 1) Macro Kjeldahl Method ^[4] 2) Semi-Micro Kjeldahl Method ^[4] |
| 43 | Total Suspended Solids | Dried at 103-105 °C ^[4] |
| 44 | Trivalent Chromium | 1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method; Colorimetric Method; Calculation ^[4] 3) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[4] |
| 45 | Zinc | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Method ^[4] <i>3mg/l</i> |

น้ำใต้ดิน...

น้ำใต้ดิน จำนวน 125 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] |
| 3 | Aldrin | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] |
| 4 | Anthracene | Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] |
| 5 | Antimony | Digestion, Inductively Coupled Plasma Spectrometric Method ^[4] |
| 6 | Arsenic | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4] |
| 7 | Atrazine | Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] |
| 8 | Barium | 1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method ^[4] 2) Digestion, Inductively Coupled Plasma 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] 3170) |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------------|--|
| 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 | Digestion, Inductively Coupled Plasma Spectrometric Method ^[4] |
| 17 | Bis(2-chloroethyl)ether | Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] |
| 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] |
| 22 | Butyl benzyl phthalate | Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] |
| 23 | Cadmium | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma 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] 3170) |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------|--|
| 27 | Chlordane | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Spectrometric Method ⁽⁴⁾ |
| 34 | Chromium (III) | 1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾ 3) Digestion, Inductively Coupled Plasma Spectrometric Method; Colorimetric Method; Calculation ⁽⁴⁾ |
| 35 | Chromium (VI) | 1) Colorimetric Method ⁽⁴⁾ 2) Extraction, Air-Acetylene Flame Method ⁽⁴⁾ |
| 36 | Chrysene | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <i>Sm)</i> |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|------------------------|---|
| 37 | Cyanide | 1) Distillation, Titrimetric Method ⁽⁴⁾ 2) Distillation, Colorimetric Method ⁽⁴⁾ |
| 38 | 2,4-D | Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ |
| 39 | DDD | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 40 | DDE | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 41 | DDT | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 42 | Dibenz(a,h)anthracene | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 43 | Di-n-butyl phthalate | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 44 | 1,2-Dichlorobenzene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 45 | 1,3-Dichlorobenzene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 46 | 1,4-Dichlorobenzene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 47 | 3,3'-Dichlorobenzidine | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 48 | 1,1-Dichloroethane | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 49 | 1,2-Dichloroethane | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <i>Sm)</i> |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------------|---|
| 50 | 1,1-Dichloroethylene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 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 | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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 | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid... |

2) Liquid-Liquid...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|--------------------------|--|
| 65 | Endrin | 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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⁾ |
| 68 | Fluorene | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 69 | Heptachlor | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 70 | Heptachlor epoxide | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) 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 | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 75 | β-HCH | 1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid... |

2) Liquid-Liquid...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---------------------------|--|
| 76 | γ-HCH | 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] 1) Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] |
| 77 | Hexachlorocyclopentadiene | 2) Liquid-Liquid Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[4] 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, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Spectrometric Method ^[4] |
| 82 | Manganese | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Spectrometric Method ^[4] |
| 83 | Mercury | Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[4] |
| 84 | Methanol | Purge and Trap Gas Chromatographic/ Mass spectrometric Method ^[4] |
| 85 | Methoxychlor | Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] |
| 86 | Methyl bromide | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^[4] |

87 Methylene chloride...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---|--|
| 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, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma 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 Method ^[4] |
| 97 | Pentachlorophenol | Liquid-Liquid Extraction, Gas Chromatographic Method ^[4] |
| 98 | pH | Electrometric method ^[4] |

99 Phenanthrene...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---|--|
| 99 | Phenanthrene | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 100 | Phenol | 1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾ 3) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 101 | Pyrene | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 102 | Selenium | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ |
| 103 | Silver | 1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma 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 | TPH (C ₅ -C ₈) | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,25) |
| 109 | TPH (C ₈ -C ₁₆) | 1) Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,21) 2) Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass spectrometric Method ^(9,25) |
| 110 | TPH (C ₁₆ -C ₃₅) | 1) Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,21) <i>simul</i> |

2) Separatory...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|------------------------|--|
| | | 2) Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass spectrometric Method ^(9,25) |
| 111 | 1,2,4-Trichlorobenzene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 112 | 1,1,1-Trichloroethane | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 113 | 1,1,2-Trichloroethane | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 114 | Trichloroethylene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 115 | 2,4,5-Trichlorophenol | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 116 | 2,4,6-Trichlorophenol | Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 117 | 1,3,5-Trimethylbenzene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 118 | Vanadium | Digestion, Inductively Coupled Plasma Spectrometric Method ⁽⁴⁾ |
| 119 | Vinyl acetate | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 120 | Vinyl chloride | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 121 | m-Xylene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 122 | o-Xylene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 123 | p-Xylene | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ |
| 124 | Xylene (Total) | Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ <i>simul</i> |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------|--|
| 125 | Zinc | 1) Digestion, Direct Air-Acetylene Flame Method ^[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^[4] 3) Digestion, Inductively Coupled Plasma Spectrometric Method ^[4] |

อากาศเสีย (ปล่อยระบาย) จำนวน 27 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|-----------------|--|
| 1 | Antimony | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 2 | Arsenic | 1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 3 | Beryllium | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 4 | Cadmium | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 5 | Carbon monoxide | Instrumental Analyzer Method ^[5] |
| 6 | Chlorine | 1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5] |
| 7 | Chromium | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 3100 |

8 Cobalt...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|-------------------|---|
| 8 | Cobalt | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 9 | Copper | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 10 | Cresol | Adsorption Sampling, Gas Chromatographic Method ^[5] |
| 11 | Dioxin/Furans | Isokinetic Sampling ^[5] |
| 12 | Hydrogen chloride | 1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5] |
| 13 | Hydrogen Fluoride | 1) Absorption Sampling, Ion Chromatographic Method ^[5] 2) Isokinetic Sampling, Ion Chromatographic Method ^[5] |
| 14 | Hydrogen Sulfide | Absorption Sampling, Iodometric Method ^[5] |
| 15 | Lead | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 16 | Manganese | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 17 | Mercury | Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5] |
| 18 | Nickel | 1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] 3100 |

19 Opacity...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|-----------------------------|--|
| 19 | Opacity | Ringelmann's Method ^[2] |
| 20 | Oxides of Nitrogen | 1) Absorption Sampling, Phenoldisulfonic acid Method ^[5] 2) Absorption Sampling, Ion Chromatographic Method ^[5] 3) Instrumental Analyzer Method ^[5] |
| 21 | Selenium | 1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 22 | Sulfur dioxide | 1) Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 3) Instrumental Analyzer Method ^[5] |
| 23 | Sulfuric acid | Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[5] |
| 24 | Tin | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 25 | Total Suspended Particulate | 1) Isokinetic Sampling, Gravimetric Method ^[5] 2) Paired Train, Isokinetic Sampling, Gravimetric Method ^[5] |
| 26 | Vanadium | Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5] |
| 27 | Xylene | 1) Adsorption Sampling, Gas Chromatographic Method ^[5] 2) Adsorption Sampling, Gas Chromatographic/Mass Spectrometric Method ^[5] |

สิ่งปฏิกูล...

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 34 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------|--|
| 1 | Aldrin | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,6,9,22] 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,6,9,27] 3) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[10,27] |
| 2 | Antimony | 1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,16] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 3 | Arsenic | 1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[1,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,16] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 4 | Barium | 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] |

2) Waste Extraction...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|-----------|--|
| 5 | Beryllium | 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 6 | Cadmium | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 7 | Chlordane | 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 8 | Chromium | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,22] 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,27] 3) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[10,27] 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] <i>3) Digestion...</i> |

3) Digestion...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------|---|
| 9 | Chromium (III) | 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^[1,6,15,17] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^[1,6,14,17] |
| 10 | Chromium (VI) | 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,15,17] 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,14,17] |
| 11 | Cobalt | 1) Waste Extraction, Colorimetric Method ^[1,17] 2) Alkaline Digestion, Colorimetric Method ^[8,17] |
| 12 | Copper | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,14] 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] <i>3) Digestion...</i> |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------|--|
| 13 | 2,4-D | 1) Waste Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁵⁾ |
| 14 | DDD | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,22) 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,27) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 15 | DDE | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,22) 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,27) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 16 | DDT | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,22) 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,27) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |

17 Dieldrin...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|------------|--|
| 17 | Dieldrin | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,22) 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,27) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 18 | Endrin | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,22) 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,27) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 19 | Heptachlor | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(1,9,22) 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(1,9,27) 3) Soxhlet Extraction, Gas Chromatographic Method ^(10,22) 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 20 | Lead | 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(1,6,13) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,14) |

3) Digestion...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|--------------|---|
| 21 | Lindane | 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,22] 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,27] 3) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[10,27] |
| 22 | Mercury | 1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1,18] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[19] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 23 | Methoxychlor | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,22] 2) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,9,27] 3) Soxhlet Extraction, Gas Chromatographic Method ^[10,22] 4) Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^[10,27] |

24 Molybdenum...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---|--|
| 24 | Molybdenum | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 25 | Nickel | 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[1,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 26 | Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 | 1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[1,9,23] 2) Soxhlet Extraction, Gas Chromatographic Method ^[10,23] |
| 27 | Pentachlorophenol | 1) Waste Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1,25] 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[25] |
| 28 | pH | Electrometric Method ^[31,32] |
| 29 | Selenium | 1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[1,6,20] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[1,6,14] 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,20] |

4) Digestion...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|-------------------|---|
| 30 | Silver | 4) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 31 | Thallium | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 32 | Trichloroethylene | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 33 | Vanadium | 1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(1,12,26) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(12,26) |
| 34 | Zinc | 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(1,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(1,6,15) 4) Digestion, Inductively Coupled Plasma Method ^(7,14) |

ดิน จำนวน 124 รายการ

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|--------------|--|
| 1 | Acenaphthene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |

2 Acetone...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------|---|
| 2 | Acetone | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 3 | Aldrin | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 4 | Anthracene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 5 | Antimony | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,16) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 6 | Arsenic | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,16) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 7 | Atrazine | Ultrasonic Extraction, Gas Chromatographic Method ^(11,24) |
| 8 | Barium | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 9 | Benz(a)anthracene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 10 | Benzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 11 | Benzo(b)fluoranthene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 12 | Benzo(k)fluoranthene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 13 | Benzoic acid | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |

14 Benzo(a)pyrene...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------------|--|
| 14 | Benzo(a)pyrene | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 15 | Benzo(g,h,i)perylene | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 16 | Beryllium | Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 17 | Bis(2-chloroethyl)ether | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 18 | Bis(2-ethylhexyl)phthalate | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 19 | Bromodichloromethane | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 20 | Bromoform | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 21 | Butanol | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 22 | Butyl benzyl phthalate | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 23 | Cadmium | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 24 | Carbazole | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 25 | Carbon disulfide | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 26 | Carbon tetrachloride | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 27 | Chlordane | 1) Ultrasonic Extraction, Gas Chromatographic Method ^[11,22] 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27] |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------|--|
| 28 | p-Chloroaniline | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 29 | Chlorobenzene | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 30 | Chlorodibromomethane | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^[13,26] |
| 31 | Chloroform | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[13,26] |
| 32 | 2-Chlorophenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[11,27] |
| 33 | Chromium | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Inductively Coupled Plasma Method ^[7,14] |
| 34 | Chromium (III) | 1) Digestion, Flame Atomic Absorption Spectrometric Method; Colorimetric Method; Calculation ^[7,8,15,17] 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^[7,8,14,17] |
| 35 | Chromium (VI) | Alkaline Digestion, Colorimetric Method ^[8,17] |
| 36 | Chrysene | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[10,27] |
| 37 | Cyanide | 1) Extraction, Distillation, Titrimetric Method ^[28,29,30] 2) Extraction, Distillation, Colorimetric Method ^[28,29,30] |
| 38 | 2,4-D | Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[24] |
| 39 | DDD | 1) Ultrasonic Extraction, Gas Chromatographic Method ^[11,22] 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^[11,27] |

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------------|---|
| 40 | DDE | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 41 | DDT | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 42 | Dibenz(a,h)anthracene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 43 | Di-n-butyl phthalate | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 44 | 1,2-Dichlorobenzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 45 | 1,3-Dichlorobenzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 46 | 1,4-Dichlorobenzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 47 | 3,3'-Dichlorobenzidine | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 48 | 1,1-Dichloroethane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 49 | 1,2-Dichloroethane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 50 | 1,1-Dichloroethylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 51 | cis-1,2-Dichloroethylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 52 | trans-1,2-Dichloroethylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 53 | 2,4-Dichlorophenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |

54 1,2-Dichloropropane...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|----------------------|---|
| 54 | 1,2-Dichloropropane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 55 | 1,3-Dichloropropane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 56 | 1,3-Dichloropropene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 57 | Dieldrin | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 58 | Diethyl phthalate | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 59 | 2,4-Dimethylphenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 60 | 2,4-Dinitrophenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 61 | 2,4-Dinitrotoluene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 62 | 2,6-Dinitrotoluene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 63 | Di-n-Octyl phthalate | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 64 | Endosulfan | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 65 | Endrin | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 66 | Ethylbenzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |

67 Fluoranthene...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---------------------------|--|
| 67 | Fluoranthene | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,27) |
| 68 | Fluorene | Soxhlet Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(10,27) |
| 69 | Heptachlor | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 70 | Heptachlor epoxide | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 71 | Hexachlorobenzene | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 72 | Hexachloro-1,3-butadiene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 73 | n-Hexane | Purge and Trap, Gas Chromatographic/ Mass Spectrometric Method ^(13,26) |
| 74 | α-HCH | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 75 | β-HCH | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 76 | γ-HCH | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 77 | Hexachlorocyclopentadiene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |

78 Hexachloroethane...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|------------------------|--|
| 78 | Hexachloroethane | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 79 | Indeno(1,2,3-cd)pyrene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 80 | Isophorone | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 81 | Lead | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 82 | Manganese | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 83 | Mercury | 1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁹⁾ 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 84 | Methanol | Ultrasonic Extraction, Direct Aqueous Injection, Gas Chromatographic Method ^(11,21) |
| 85 | Methoxychlor | 1) Ultrasonic Extraction, Gas Chromatographic Method ^(11,22) 2) Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 86 | Methyl bromide | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 87 | Methylene chloride | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 88 | 2-Methylphenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 89 | 2-Methylnaphthalene | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |

90 Methyl tert-butyl ether...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---|---|
| 90 | Methyl tert-butyl ether | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 91 | Naphthalene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 92 | Nickel | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 93 | Nitrobenzene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 94 | N-Nitrosodiphenylamine | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 95 | N-Nitrosodi-n-propylamine | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 96 | Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 | Soxhlet Extraction, Gas Chromatographic Method ^(10,23) |
| 97 | Pentachlorophenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽²⁴⁾ |
| 98 | Phenanthrene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 99 | Phenol | Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(11,27) |
| 100 | Pyrene | Soxhlet Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,27) |
| 101 | Selenium | 1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,20) |

2) Digestion...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|---|--|
| 102 | Silver | 2) Digestion, Inductively Coupled Plasma Method ^(7,14) 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 103 | Styrene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 104 | 1,1,2,2-Tetrachloroethane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 105 | Tetrachloroethylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 106 | Toluene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 107 | TPH (C ₅ -C ₉) | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 108 | TPH (C ₈ -C ₁₆) | 1) Soxhlet Extraction, Gas Chromatographic Method ^(10,21) 2) Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(10,26) |
| 109 | TPH (C ₁₆ -C ₃₅) | 1) Soxhlet Extraction, Gas Chromatographic Method ^(10,21) 2) Soxhlet Extraction, Gas Chromatographic/Mass spectrometric Method ^(10,26) |
| 110 | 1,2,4-Trichlorobenzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 111 | 1,1,1-Trichloroethane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 112 | 1,1,2-Trichloroethane | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 113 | Trichloroethylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |

114 2,4,5-Trichlorophenol...

| ลำดับที่ | สารมลพิษ | วิธีวิเคราะห์ |
|----------|------------------------|---|
| 114 | 2,4,5-Trichlorophenol | Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 115 | 2,4,6-Trichlorophenol | Ultrasonic Extraction, Gas Chromatographic/ Mass Spectrometric Method ^(11,27) |
| 116 | 1,3,5-Trimethylbenzene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 117 | Vanadium | Digestion, Inductively Coupled Plasma Method ^(7,14) |
| 118 | Vinyl acetate | Purge and Trap, Gas Chromatographic/Mass spectrometric Method ^(13,26) |
| 119 | Vinyl chloride | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 120 | m-Xylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 121 | o-Xylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 122 | p-Xylene | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 123 | Xylene (Total) | Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,26) |
| 124 | Zinc | 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) <i>วิภาดา</i> |

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
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ที่ อก ๐๓๑๐(๑)/ ๕๐ ๕๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๗ พฤษภาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ซีคอน จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๒๑ พฤษภาคม ๒๕๖๗

ตามคำขอที่อ้างถึง บริษัท ซีคอน จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๒๓๙
สถานที่ตั้งเลขที่ ๒๓๙ ถนนริมคลองประปา แขวงบางซื่อ เขตบางซื่อ กรุงเทพมหานคร ขอเปลี่ยนแปลงบุคลากร
ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์
จำนวน ๒ ราย ได้แก่

๑) นายวัชรกานต์ ประมาคะเต

ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๑๕

๒) นายรัตนชัย ชอบทำกิจ

ทะเบียนเลขที่ ว-๒๓๙-จ-๐๐๓๐

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

น

(นายพรยศ กลั่นกรอง)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th



ภาคผนวก จ

ใบรับรองความสามารถห้องปฏิบัติการและขอบข่ายการรับรอง
ห้องปฏิบัติการทดสอบ ตามมาตรฐาน ISO/IEC 17025
จากสำนักงานมาตรฐานอุตสาหกรรม (สมอ.)



แบบ กมร./กมอ.๒
Form NSC/TISI 2

ใบรับรองเลขที่ 24-LB0026
(Certificate No.)

ใบรับรองระบบงาน (Certificate of Accreditation)

อาศัยอำนาจตามความในพระราชบัญญัติการมาตรฐานแห่งชาติ พ.ศ. ๒๕๕๑
(By Virtue of National Standardization Act B.E. 2551 (2008))

เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Secretary-General, Thai Industrial Standards Institute)

ออกใบรับรองฉบับนี้ให้
(Issues this certificate to)

บริษัท ซีคอต จำกัด ฝ่ายห้องปฏิบัติการทดสอบด้านสิ่งแวดล้อม
(Secot Company Limited, Environmental Laboratory Division)

ตั้งอยู่เลขที่
(Address)

๒๓๙ ถนนริมคลองประปา แขวงบางซื่อ เขตบางซื่อ กรุงเทพมหานคร
(239 Rimklongprapa Road, Bangsue, Bangkok)

ได้รับการรับรองความสามารถ
(Certificate of competence)

ตามมาตรฐานเลขที่ มอก. ๑๗๐๒๕ - ๒๕๖๑
(Standard No. TIS 17025-2561 (2018) (ISO/IEC 17025: 2017))

ข้อกำหนดทั่วไปว่าด้วยความสามารถของ ห้องปฏิบัติการทดสอบและห้องปฏิบัติการสอบเทียบ
(General requirements for the competence of testing and calibration laboratories)

หมายเลขการรับรองที่ ทดสอบ ๐๓๙๔
(Accreditation No. Testing 0394)

โดยมีรายละเอียดสาขาและขอบข่ายที่ใบรับรอง แสดงไว้ใน QR CODE และ www.tisi.go.th
(Details of the scheme and scope of the certificate are shown in QR CODE and www.tisi.go.th)

ออกให้ ณ วันที่ ๖ ธันวาคม พ.ศ. ๒๕๖๖
(Issue date : 6 December B.E. 2566 (2023))


(นายวีระศักดิ์ เพ็งหล่ง)
ผู้อำนวยการสำนักงานคณะกรรมการการมาตรฐานแห่งชาติ
ปฏิบัติราชการแทน
เลขาธิการสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม



Signed by สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม (สมอ.)
Thai Industrial Standards Institute (TISI)
Date: 2023-12-06T08:49:04.416+07:00
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กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Ministry of Industry, Thailand, Thai Industrial Standards Institute)



รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ
(Scope of Accreditation for Testing)
ใบรับรองเลขที่ 24-LB0026
(Certification No. 24-LB0026)



ชื่อห้องปฏิบัติการ
(Laboratory Name)

หมายเลขการรับรองที่
(Accreditation No.)

ฉบับที่ 02
(Issue No.02)

สถานภาพห้องปฏิบัติการ
(Laboratory status)

บริษัท ซีคอต จำกัด ฝ่ายห้องปฏิบัติการทดสอบด้านสิ่งแวดล้อม
(Secot Company Limited, Environmental Laboratory Division)

ทดสอบ 0394
(Testing 0394)

ออกให้ตั้งแต่วันที่ 30 ตุลาคม พ.ศ. 2566
(Valid from) (30 October B.E.2566 (2023))

☒ถาวร
(Permanent)

☐นอกสถานที่
(Site)

☐ชั่วคราว
(Temporary)

ถึงวันที่ 8 กันยายน พ.ศ. 2571
(Until) (8 September B.E.2571 (2028))

☐เคลื่อนที่
(Mobile)

☐หลายสถานที่
(Multisite)

| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|---|--|
| สาขาสิ่งแวดล้อม (environmental field) 1. น้ำและน้ำเสีย (water and wastewater) | - โลหะหนัก (heavy metals) • สารหนู (Arsenic, As) 0.000 5 mg/L ถึง 0.090 0 mg/L • สารหนู (Arsenic, As) 0.05 mg/L ถึง 4.50 mg/L • แบเรียม (Barium, Ba) 0.02 mg/L ถึง 4.50 mg/L • แคดเมียม (Cadmium, Cd) 0.01 mg/L ถึง 4.50 mg/L • โครเมียม (Chromium, Cr) 0.01 mg/L ถึง 4.50 mg/L | - Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd edition, 2017, Part 3030 F and Part 3114 C - Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd edition, 2017, Part 3030 E and Part 3120 B |

กระทรวงอุตสาหกรรม สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
(Ministry of Industry, Thailand, Thai Industrial Standards Institute)

หน้า 1/9

รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ
(Scope of Accreditation for Testing)
ใบรับรองเลขที่ 24-LB0026
(Certification No. 24-LB0026)



ฉบับที่ 02
(Issue No.02)

ออกให้ตั้งแต่วันที่ 30 ตุลาคม พ.ศ. 2566
(Valid from) (30 October B.E.2566 (2023))

ถึงวันที่ 8 กันยายน พ.ศ. 2571
(Until) (8 September B.E.2571 (2028))

สถานภาพห้องปฏิบัติการ
(Laboratory status)

☒ถาวร
(Permanent)

☐นอกสถานที่
(Site)

☐ชั่วคราว
(Temporary)

☐เคลื่อนที่
(Mobile)

☐หลายสถานที่
(Multisite)

| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|---|--|
| สาขาสิ่งแวดล้อม (environmental field) 1. น้ำและน้ำเสีย (ต่อ) (water and wastewater) (cont.) | - โลหะหนัก (heavy metals) • ทองแดง (Copper, Cu) 0.02 mg/L ถึง 4.50 mg/L • เหล็ก (Iron, Fe) 0.05 mg/L ถึง 9.00 mg/L • ตะกั่ว (Lead, Pb) 0.03 mg/L ถึง 4.50 mg/L • แมงกานีส (Manganese, Mn) 0.01 mg/L ถึง 9.00 mg/L • นิกเกิล (Nickel, Ni) 0.01 mg/L ถึง 4.50 mg/L • สังกะสี (Zinc, Zn) 0.02 mg/L ถึง 9.00 mg/L | - Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd edition, 2017, Part 3030 E and Part 3120 B |

รายละเอียดสาขาและขอบข่ายใบรับรองห้องปฏิบัติการ
(Scope of Accreditation for Testing)
ใบรับรองเลขที่ 24-LB0026
(Certification No. 24-LB0026)



ฉบับที่ 02
(Issue No.02)

ออกให้ตั้งแต่วันที่ 30 ตุลาคม พ.ศ. 2566
(Valid from) (30 October B.E.2566 (2023))

ถึงวันที่ 8 กันยายน พ.ศ. 2571
(Until) (8 September B.E.2571 (2028))

สถานภาพห้องปฏิบัติการ
(Laboratory status)

☒ถาวร
(Permanent)

☐นอกสถานที่
(Site)

☐ชั่วคราว
(Temporary)

☐เคลื่อนที่
(Mobile)

☐หลายสถานที่
(Multisite)

| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|--|---|
| สาขาสิ่งแวดล้อม (environmental field) 1. น้ำและน้ำเสีย (ต่อ) (water and wastewater) (cont.) | - ซีโอดี (Chemical oxygen demand, COD) 100 mg/L ถึง 4 000 mg/L | - Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, 23 rd edition, 2017, Part 5220 D |
| 2. บริเวณทำงาน (workplace) | - ฝุ่นละอองรวม (Total dust) 0.10 mg/filter ถึง 2.00 mg/filter - ฝุ่นละอองขนาดเล็ก (Respirable dust) 0.10 mg/filter ถึง 2.00 mg/filter | - NIOSH Manual of Analytical Methods (NMAM), method 0500, 4 th edition, 15 th August 1994 (Exclude Sampling) - NIOSH Manual of Analytical Methods (NMAM), method 0600, 4 th edition, 15 th January 1998 (Exclude Sampling) |

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ฉบับที่ 02
(Issue No.02)

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(Valid from) (30 October B.E.2566 (2023))

ถึงวันที่ 8 กันยายน พ.ศ. 2571
(Until) (8 September B.E.2571 (2028))

สถานภาพห้องปฏิบัติการ
(Laboratory status)

☒ถาวร
(Permanent)

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(Site)

☐ชั่วคราว
(Temporary)

☐เคลื่อนที่
(Mobile)

☐หลายสถานที่
(Multisite)

| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|---|---|---|
| สาขาสิ่งแวดล้อม (environmental field) | | |
| 2. บริเวณทำงาน (ต่อ) (workplace) (cont.) | <ul style="list-style-type: none"> เบนซีน (Benzene) 1.10 µg/tube ถึง 420 µg/tube โทลูอีน (Toluene) 1.10 µg/tube ถึง 420 µg/tube โทโครไซลีน (Total xylenes) 2.20 µg/tube ถึง 840 µg/tube เมตา, พารา-ไซลีน (m, p- Xylene) 1.10 µg/tube ถึง 420 µg/tube ออร์โธ-ไซลีน (o- Xylene) 1.10 µg/tube ถึง 420 µg/tube | <ul style="list-style-type: none"> NIOSH Manual of Analytical Methods (NMAM) , method 1501, 4th edition , 15th March 2003 (Exclude Sampling) |
| 3. ปล่องระบายอากาศ (stack) | <ul style="list-style-type: none"> ซัลเฟอร์ไดออกไซด์ (Sulfur dioxide) 1.00 mg/L ถึง 16 000 mg/L (solution) | <ul style="list-style-type: none"> US.EPA , Code of Federal Regulations , 40 CFR 60 appendix A , method 6 , July 2019 (Exclude Sampling) |

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| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|---|--|---|
| สาขาสิ่งแวดล้อม (environmental field) | | |
| 3. ปล่องระบายอากาศ (ต่อ) (stack) (cont.) | <ul style="list-style-type: none"> ไฮโดรเจนฟลูออไรด์ (Hydrogen fluoride) 5 µg/sample ถึง 400 µg/sample ไฮโดรเจนคลอไรด์ (Hydrogen chloride) 5 µg/sample ถึง 400 µg/sample | <ul style="list-style-type: none"> WI-7.2-1-22 based on US.EPA , Code of Federal Regulations , 40 CFR 60 appendix A, method 26 , 2019 (Exclude Sampling) |

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| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|---|--|
| สาขาสิ่งแวดล้อม (environmental field) | | |
| 4. บรรยากาศทั่วไป (ambient air) | <ul style="list-style-type: none"> สารอินทรีย์ระเหยง่าย (Volatile organic compounds, VOCs) คลอโรอีเทน (Chloroethene) 0.05 $\mu\text{g}/\text{m}^3$ ถึง 51.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) 1,3-บิวทาไดเ็น (1,3-butadiene) 0.04 $\mu\text{g}/\text{m}^3$ ถึง 44.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) โบรมอมีเทน (Bromomethane) 0.08 $\mu\text{g}/\text{m}^3$ ถึง 77.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) อะคลอเล็น (Acrolein) 0.05 $\mu\text{g}/\text{m}^3$ ถึง 45.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) | - WI-7.2-1-24 based on US EPA , Compendium Method TO-15 , EPA/625/R-96/010b, Second edition, January 1999 |

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| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|--|--|
| สาขาสิ่งแวดล้อม (environmental field) | | |
| 4. บรรยากาศทั่วไป (ต่อ) (ambient air) (cont.) | <ul style="list-style-type: none"> สารอินทรีย์ระเหยง่าย (Volatile organic compounds, VOCs) อะคริโนไตรล์ (Acrylonitrile) 0.04 $\mu\text{g}/\text{m}^3$ ถึง 43.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) ไดคลอโรมีเทน (Dichloromethane) 0.14 $\mu\text{g}/\text{m}^3$ to 69.00 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) คาร์บอนไดซัลไฟด์ (Carbon disulfide) 0.06 $\mu\text{g}/\text{m}^3$ ถึง 62.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) ไตรคลอโรมีเทน (Trichloromethane) 0.20 $\mu\text{g}/\text{m}^3$ ถึง 97.00 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) 1,2-ไดคลอโรอีเทน (1,2-dichloroethane) 0.08 $\mu\text{g}/\text{m}^3$ ถึง 80.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) | - WI-7.2-1-24 based on US EPA , Compendium Method TO-15 , EPA/625/R-96/010b, Second edition, January 1999 |

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| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|--|--|
| <p>สาขาส่งแวดล้อม (environmental field)</p> <p>4. บรรยากาศทั่วไป (ต่อ) (ambient air) (cont.)</p> | <ul style="list-style-type: none"> สารอินทรีย์ระเหยง่าย (Volatile organic compounds, VOCs) เบนซีน (Benzene) 0.06 $\mu\text{g}/\text{m}^3$ ถึง 63.00 $\mu\text{g}/\text{m}^3$ (0.02 ppbv ถึง 20.00 ppbv) คาร์บอนเตตระคลอไรด์ (Carbon tetrachloride) 0.25 $\mu\text{g}/\text{m}^3$ ถึง 125 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) ไตรคลอโรเอทิลีน (Trichloroethylene) 0.21 $\mu\text{g}/\text{m}^3$ ถึง 107 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) 1,2-ไดคลอโรโพรเพน (1,2-dichloropropane) 0.18 $\mu\text{g}/\text{m}^3$ ถึง 92.00 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) เตตระคลอโรเอทิลีน (Tetrachloroethylene) 0.27 $\mu\text{g}/\text{m}^3$ ถึง 135 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) | <p>WI-7.2-1-24 based on US EPA , Compendium Method TO-15 , EPA/625/R-96/010b, Second edition, January 1999</p> |

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ฉบับที่ 02
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| สาขาการทดสอบ (Field of Testing) | รายการทดสอบ (Parameter) | วิธีทดสอบ (Test Method) |
|--|--|--|
| <p>สาขาส่งแวดล้อม (environmental field)</p> <p>4. บรรยากาศทั่วไป (ต่อ) (ambient air) (cont.)</p> | <ul style="list-style-type: none"> สารอินทรีย์ระเหยง่าย (Volatile organic compounds ,VOCs) 1,2-ไดโบรมีเอเทน (1,2-dibromoethane) 0.31 $\mu\text{g}/\text{m}^3$ ถึง 153 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) 1,1,2,2-เตตระคลอโรอีเทน (1,1,2,2-tetrachloroethane) 0.69 $\mu\text{g}/\text{m}^3$ ถึง 137 $\mu\text{g}/\text{m}^3$ (0.10 ppbv ถึง 20.00 ppbv) เบนซิลคลอไรด์ (Benzyl chloride) 0.52 $\mu\text{g}/\text{m}^3$ ถึง 103 $\mu\text{g}/\text{m}^3$ (0.10 ppbv ถึง 20.00 ppbv) 1,4-ไดคลอโรเบนซีน (1,4-dichlorobenzene) 0.24 $\mu\text{g}/\text{m}^3$ ถึง 120 $\mu\text{g}/\text{m}^3$ (0.04 ppbv ถึง 20.00 ppbv) | <p>WI-7.2-1-24 based on US EPA , Compendium Method TO-15 , EPA/625/R-96/010b, Second edition, January 1999</p> |