



**MICROBIOLOGY Test Report**

**Customer Details**

**Crystalline Environmental Services**

Report No. WA-R-L-2003-5442



|                       |                               |                     |                    |
|-----------------------|-------------------------------|---------------------|--------------------|
| Request No.           | : WA-Q-L-2003-0915            | Sample No.          | : WA-S-L-2003-5340 |
| Sampling Date/time    | : 21/3/2020 , 14:50           | Report Date.        | : 24/3/2020        |
| Analysis Start Date.  | : 21/3/2020                   | Analysis End Date.  | : 23/3/2020        |
| Sample Location.      | : ADIA CAR PARKING, ABU DHABI | Sampled By          | : Shoukth          |
| Sample Identification | : NOT GIVEN                   | Sample Submitted as | : WATER            |
| Sample Certificate No | : 0144                        | Sampling Method     | : APHA 9060 A & B  |
| Temperature °C        | : 34.6                        | Site Observation    | : CLEAR            |
| Sampling Container    | : STERILE PLASTIC BOTTLE      | Source of Sample    | : COOLING TOWER 2  |
| Sampling Point        | : NOT GIVEN                   | Preservation        | : 4-8°C            |
| Sample Description    | : WATER                       |                     |                    |

| Parameters                | Test Methods     | Units      | Results      | Specification |
|---------------------------|------------------|------------|--------------|---------------|
| Escherichia Coli          | APHA 9222 B,H& I | CFU/100 ml | Not Detected | --            |
| Faecal Coliforms          | APHA 9222 D      | CFU/100 ml | Not Detected | --            |
| Heterotrophic plate count | APHA 9215 B      | CFU/ml     | Not Detected | 10000CFU/ml   |
| Pseudomonas aeruginosa    | CCFRA 2.5.2      | CFU/250 ml | Not Detected | --            |
| Total Coliforms           | APHA 9222 B      | CFU/100 ml | Not Detected | --            |

Note : Not Detected=<1CFU

Limit based on DM.Rev2.Dated 6/2010 for guidelines for control of legionella in water system. Public Safety Department.

**Remarks :The tested results of the sample are found to be satisfactory within the specified limits.**

|         |             |                  |
|---------|-------------|------------------|
| Analyst | Reviewed By | Method Variation |
| HS      | SM          | None             |

Key Words :CFU-Colony Forming Unit; APHA-American Public Health Association; CCFRA-Campden Chorleywood Food Research Association.

**Signed for and on behalf of Wimpey Laboratories**



**Dr. Suresh Murugan Ph.D**

Senior Microbiologist

Test results relate only to the samples tested.

This report shall not be reproduced except in full, without the written approval of the Laboratory.

This is a LIMS software generated document with E Signature.

Form No: WARF-MB-01 Issue No.:01 Rev No:00 Issued Date:22-01-2020

- End of Text -



**MICROBIOLOGY Test Report**

**Customer Details**

**Crystalline Environmental Services**

Report No. WA-R-L-2003-5444



|                       |                               |                     |                    |
|-----------------------|-------------------------------|---------------------|--------------------|
| Request No.           | : WA-Q-L-2003-0915            | Sample No.          | : WA-S-L-2003-5343 |
| Sampling Date/time    | : 21/3/2020 , 14:50           | Report Date.        | : 24/3/2020        |
| Analysis Start Date.  | : 22/3/2020                   | Analysis End Date.  | : 23/3/2020        |
| Sample Location.      | : ADIA CAR PARKING, ABU DHABI | Sampled By          | : Shoukth          |
| Sample Identification | : NOT GIVEN                   | Sample Submitted as | : WATER            |
| Sample Certificate No | : 0144                        | Sampling Method     | : APHA 9060 A & B  |
| Temperature °C        | : 35                          | Site Observation    | : CLEAR            |
| Sampling Container    | : STERILE PLASTIC BOTTLE      | Source of Sample    | : COOLING TOWER 4  |
| Sampling Point        | : NOT GIVEN                   | Preservation        | : 4-8°C            |
| Sample Description    | : WATER                       |                     |                    |

| Parameters                | Test Methods     | Units      | Results      | Specification |
|---------------------------|------------------|------------|--------------|---------------|
| Escherichia Coli          | APHA 9222 B,H& I | CFU/100 ml | Not Detected | --            |
| Faecal Coliforms          | APHA 9222 D      | CFU/100 ml | Not Detected | --            |
| Heterotrophic plate count | APHA 9215 B      | CFU/ml     | Not Detected | 10000CFU/ml   |
| Pseudomonas aeruginosa    | CCFRA 2.5.2      | CFU/250 ml | Not Detected | --            |
| Total Coliforms           | APHA 9222 B      | CFU/100 ml | Not Detected | --            |

Note : Not Detected=<1CFU

Limit based on DM.Rev2.Dated 6/2010 for guidelines for control of legionella in water system. Public Safety Department.

**Remarks :The tested results of the sample are found to be satisfactory within the specified limits.**

|         |             |                  |
|---------|-------------|------------------|
| Analyst | Reviewed By | Method Variation |
| HS      | SM          | None             |

Key Words :CFU-Colony Forming Unit; APHA-American Public Health Association; CCFRA-Campden Chorleywood Food Research Association.

**Signed for and on behalf of Wimpey Laboratories**

**Dr. Suresh Murugan Ph.D**  
Senior Microbiologist



Test results relate only to the samples tested.

This report shall not be reproduced except in full, without the written approval of the Laboratory.

This is a LIMS software generated document with E Signature.

Form No: WARF-MB-01 Issue No.:01 Rev No:00 Issued Date:22-01-2020

- End of Text -



**Legionella Test Report**

**Customer Details**

**Crystalline Environmental Services**

Report No. WA-R-L-2003-5447



|                       |                               |                     |                    |
|-----------------------|-------------------------------|---------------------|--------------------|
| Request No.           | : WA-Q-L-2003-0915            | Sample No.          | : WA-S-L-2003-5345 |
| Sampling Date/time    | : 21/3/2020 , 14:50           | Report Date.        | : 31/3/2020        |
| Analysis Start Date.  | : 21/3/2020                   | Analysis End Date.  | : 31/3/2020        |
| Sample Location.      | : ADIA CAR PARKING, ABU DHABI | Sampled By          | : Shoukth          |
| Sample Identification | : NOT GIVEN                   | Sample Submitted as | : WATER            |
| Sample Certificate No | : 0144                        | Sampling Method     | : BS 7592          |
| Temperature °C        | : 35                          | Site Observation    | : CLEAR            |
| Sampling Container    | : STERILE PLASTIC BOTTLE      | Source of Sample    | : COOLING TOWER 4  |
| Sampling Point        | : NOT GIVEN                   | Preservation        | : 10°C             |
| Sample Description    | : WATER                       |                     |                    |

| Parameters | Test Methods | Units | Results      | Specification |
|------------|--------------|-------|--------------|---------------|
| Legionella | ISO 11731    | CFU/L | Not Detected | 100CFU/L      |

Note : Limit of Detection=<20CFU/L

Procedure: WSOP-MB-0051. Filtration, Washing, Heat Treatment, Acid Treatment followed by Plating on GVPC/BCYE Agar.

Limit based on DM.Rev2.Dated 6/2010 for guidelines for control of legionella in water system. Public Safety Department.

**Remarks :**The tested result of the sample is found to be satisfactory within the specified limits.

| Analyst | Reviewed By | Method Variation |
|---------|-------------|------------------|
| HS      | SM          | None             |

Key Words :CFU-Colony Forming Unit; BS-British Standard; ISO-International Organization for Standardization.

**Signed for and on behalf of Wimpey Laboratories**

**Dr. Suresh Murugan Ph.D**  
Senior Microbiologist



Test results relate only to the samples tested.

This report shall not be reproduced except in full, without the written approval of the Laboratory.

This is a LIMS software generated document with E Signature.

Form No: WARF-MB-03 Issue No.:01 Rev No:00 Issued Date:22-01-2020

- End of Text -



**Legionella Test Report**

**Customer Details**

Report No. WA-R-L-2003-5443

**Crystalline Environmental Services**



|                       |                               |                     |                    |
|-----------------------|-------------------------------|---------------------|--------------------|
| Request No.           | : WA-Q-L-2003-0915            | Sample No.          | : WA-S-L-2003-5342 |
| Sampling Date/time    | : 21/3/2020 , 14:50           | Report Date.        | : 31/3/2020        |
| Analysis Start Date.  | : 21/3/2020                   | Analysis End Date.  | : 31/3/2020        |
| Sample Location.      | : ADIA CAR PARKING, ABU DHABI | Sampled By          | : Shoukth          |
| Sample Identification | : NOT GIVEN                   | Sample Submitted as | : WATER            |
| Sample Certificate No | : 0144                        | Sampling Method     | : BS 7592          |
| Temperature °C        | : 34.6                        | Site Observation    | : CLEAR            |
| Sampling Container    | : STERILE PLASTIC BOTTLE      | Source of Sample    | : COOLING TOWER 2  |
| Sampling Point        | : NOT GIVEN                   | Preservation        | : 10°C             |
| Sample Description    | : WATER                       |                     |                    |

| Parameters | Test Methods | Units | Results      | Specification |
|------------|--------------|-------|--------------|---------------|
| Legionella | ISO 11731    | CFU/L | Not Detected | 100CFU/L      |

Note : Limit of Detection= <20CFU/L

Procedure: WSOP-MB-0051. Filtration, Washing, Heat Treatment, Acid Treatment followed by Plating on GVPC/BCYE Agar.

Limit based on DM.Rev2.Dated 6/2010 for guidelines for control of legionella in water system. Public Safety Department.

Remarks :The tested result of the sample is found to be satisfactory within the specified limits.

|         |             |                  |
|---------|-------------|------------------|
| Analyst | Reviewed By | Method Variation |
| HS      | SM          | None             |

Key Words :CFU-Colony Forming Unit; BS-British Standard; ISO-International Organization for Standardization.

**Signed for and on behalf of Wimpey Laboratories**

**Dr. Suresh Murugan Ph.D**  
Senior Microbiologist



Test results relate only to the samples tested.

This report shall not be reproduced except in full, without the written approval of the Laboratory.

This is a LIMS software generated document with E Signature.

Form No: WARF-MB-03 Issue No.:01 Rev No:00 Issued Date:22-01-2020

- End of Text -



Microbiology Test Report

Customer Details

Report No. WA-R-L-2003-5448

Crystalline Environmental Services



|                       |                               |                     |                      |
|-----------------------|-------------------------------|---------------------|----------------------|
| Request No.           | : WA-Q-L-2003-0915            | Sample No.          | : WA-S-L-2003-5347   |
| Sampling Date/time    | : 21/3/2020 , 14:50           | Report Date.        | : 24/3/2020          |
| Analysis Start Date.  | : 21/3/2020                   | Analysis End Date.  | : 23/3/2020          |
| Sample Location.      | : ADIA CAR PARKING, ABU DHABI | Sampled By          | : Shoukth            |
| Sample Identification | : NOT GIVEN                   | Sample Submitted as | : WATER              |
| Sample Certificate No | : 0144                        | Sampling Method     | : APHA 9060 A & B    |
| Temperature °C        | : 33.9                        | Site Observation    | : CLEAR              |
| Sampling Container    | : STERILE PLASTIC BOTTLE      | Source of Sample    | : MAKE UP WATER TANK |
| Sampling Point        | : NOT GIVEN                   | Preservation        | : 4-8°C              |
| Sample Description    | : WATER                       |                     |                      |

| Parameters                | Test Methods     | Units      | Results      | Specification |
|---------------------------|------------------|------------|--------------|---------------|
| Escherichia Coli          | APHA 9222 B,H& I | CFU/100 ml | Not Detected | Zero/100ml    |
| Faecal Coliforms          | APHA 9222 D      | CFU/100 ml | Not Detected | Zero/100ml    |
| Heterotrophic plate count | APHA 9215 B      | CFU/100 ml | Not Detected | 10000CFU/ml   |
| Pseudomonas aeruginosa    | CCFRA 2.5.2      | CFU/250 ml | Not Detected | Zero          |
| Total Coliforms           | APHA 9222 B      | CFU/100 ml | Not Detected | Zero/100ml    |

Note : Not Detected=<1CFU

Limit based on DM.Rev2.Dated 6/2010 for guidelines for control of legionella in water system. Public Safety Department.

Remarks :The tested results of the sample are found to be satisfactory within the specified limits.

|         |             |                  |
|---------|-------------|------------------|
| Analyst | Reviewed By | Method Variation |
| HS      | SM          | None             |

Key Words :CFU-Colony Forming Unit; APHA-American Public Health Association; CCFRA-Campden Chorleywood Food Research Association.

Signed for and on behalf of Wimpey Laboratories

Dr. Suresh Murugan Ph.D  
Senior Microbiologist



Test results relate only to the samples tested.  
This report shall not be reproduced except in full, without the written approval of the Laboratory.  
This is a LIMS software generated document with E Signature.

Form No: WARF-MB-01 Issue No.:01 Rev No:00 Issued Date:22-01-2020

- End of Text -



**Legionella Test Report**

**Customer Details**

**Crystalline Environmental Services**

Report No. WA-R-L-2003-5449



|                       |                               |                     |                      |
|-----------------------|-------------------------------|---------------------|----------------------|
| Request No.           | : WA-Q-L-2003-0915            | Sample No.          | : WA-S-L-2003-5348   |
| Sampling Date/time    | : 21/3/2020 , 14:50           | Report Date.        | : 31/3/2020          |
| Analysis Start Date.  | : 21/3/2020                   | Analysis End Date.  | : 31/3/2020          |
| Sample Location.      | : ADIA CAR PARKING, ABU DHABI | Sampled By          | : Shoukth            |
| Sample Identification | : NOT GIVEN                   | Sample Submitted as | : WATER              |
| Sample Certificate No | : 0144                        | Sampling Method     | : BS 7592            |
| Temperature °C        | : 33.9                        | Site Observation    | : CLEAR              |
| Sampling Container    | : STERILE PLASTIC BOTTLE      | Source of Sample    | : MAKE UP WATER TANK |
| Sampling Point        | : NOT GIVEN                   | Preservation        | : 10°C               |
| Sample Description    | : WATER                       |                     |                      |

| Parameters | Test Methods | Units | Results      | Specification |
|------------|--------------|-------|--------------|---------------|
| Legionella | ISO 11731    | CFU/L | Not Detected | Zero/L        |

Note : Limit of Detection=<1CFU/L

Procedure: WSOP-MB-0051 Direct Placing of Membrane on BCYE+L-Cysteine/Membrane Filter Followed by Washing Procedure in Funnel.

Limits based on RSB Water Quality Regulation 2014. Schedule 1. Table F For Microbiological Parameters.

**Remarks :The tested result of the sample is found to be satisfactory within the specified limits.**

|         |             |                  |
|---------|-------------|------------------|
| Analyst | Reviewed By | Method Variation |
| HS      | SM          | None             |

Key Words :CFU-Colony Forming Unit; BS-British Standard; ISO-International Organization for Standardization.

**Signed for and on behalf of Wimpey Laboratories**



**Dr. Suresh Murugan Ph.D**

Senior Microbiologist

Test results relate only to the samples tested.

This report shall not be reproduced except in full, without the written approval of the Laboratory.

This is a LIMS software generated document with E Signature.

Form No: WARF-MB-03 Issue No.:01 Rev No:00 Issued Date:22-01-2020

- End of Text -

## COOLING TOWER ANALYSIS REPORT

**Client Name: SERCO, MIDDLE EAST**

|                      |   |                        |                    |
|----------------------|---|------------------------|--------------------|
| <b>Site location</b> | ABU DHABI INVESTMENT AUTHORITY, ABU DHABI | <b>Service Visit:</b>  | <b>15-02-2020</b>  |
| <b>Sampled By</b>    | Crystalline Rep                           | <b>Sample Location</b> | ADIA - Car Parking |
| <b>Sample Type</b>   | Cooling Tower                             |                        |                    |

### TEST RESULT

|    | Parameter                    | Control limits   | Make up water | Cooling tower -1 | Cooling tower-2 | Cooling tower -3 | Cooling tower -4 |
|----|------------------------------|------------------|---------------|------------------|-----------------|------------------|------------------|
| 1  | pH at 25°C                   | 8.5-9.5          | 7.89          | ---              | 8.15            | ---              | 8.17             |
| 2  | Conductivity at 25°C, µs/cm  | Max 1500         | 194           | ---              | 1364            | ---              | 1382             |
| 3  | Total Dissolved Solids (TDS) | Max 1000         | 126           | ---              | 886             | ---              | 898              |
| 4  | Residual Chlorine            | 0.2 - 0.5        | 0.12          | ---              | <0.05           | ---              | <0.05            |
| 5  | Calcium Hardness             | 200-350          | 46            | ---              | 338             | ---              | 326              |
| 6  | Chlorides                    | Max 200          | 32            | ---              | 188             | ---              | 174              |
| 7  | Iron                         | 0 - 2.0          | <0.03         | ---              | 0.05            | ---              | <0.05            |
| 8  | Phosphate/phosphonate        | 4 - 6            | ---           | ---              | 4.8             | ---              | 4.9              |
| 9  | Cycles of concentration      | 5 - 6            | ---           | ---              | 5.8             | ---              | 5.4              |
| 10 | Calcium hardness balance     | 0.95 - 1.05      | ---           | ---              | 1.2             | ---              | 1.2              |
| 11 | Dip slide                    | <10 <sup>3</sup> | ND            | ---              | ND              | ---              | ND               |

\*\*\* All test results expressed in parts per million (ppm) as CaCO<sub>3</sub> except pH and conductivity (µmhos).

### COMMENTS AND RECOMMENDATIONS

|   | Cooling Tower-1 | Cooling Tower-2                                       | Cooling Tower-3 | Cooling Tower-4                                       |
|---|-----------------|---|-----------------|---|
| 1 | ----            | PH Level is satisfactory                              | ----            | PH Level is satisfactory                              |
| 2 | ----            | Conductivity & TDS levels are satisfactory            | ----            | Conductivity & TDS levels are satisfactory            |
| 3 | ----            | Calcium Hardness and Chloride levels are satisfactory | ----            | Calcium Hardness and Chloride levels are satisfactory |
| 4 | ----            | Dissolved iron levels are satisfactory                | ----            | Dissolved iron levels are satisfactory                |

Reported By,

*Marugaraaj*  
Marugaraaj  
Service Engineer



**CLEANER WATER GREENER TOMORROW**