# *Ceriodaphnia dubia*

# REFERENCE TOXICANT TEST DATA

# CETIS Summary Report

Report Date: 14 Sep-12 11:24 (p 1 of 2)
Test Code: CS08-12CCd | 09-7704-7591

**Ceriodaphnia 7-d Survival and Reproduction Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 10-1097-2582 | **Test Type:** | Reproduction-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 07:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 06:30 | **Species:** | Ceriodaphnia dubia | **Brine:** | |
| **Duration:** | 7d | **Source:** | In-House Culture | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 19-1576-1036 | **Code:** | 7230318C | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 07:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 07:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

## Comparison Summary

| Analysis ID | Endpoint | NOEL | LOEL | TOEL | PMSD | TU | Method |
|---|---|---|---|---|---|---|---|
| 09-0104-4700 | 7d Survival Rate | 7.5 | 10 | 8.66 | NA | | Fisher Exact/Bonferroni-Holm Test |
| 07-4810-2665 | Reproduction | 2 | 5 | 3.162 | 18.2% | | Dunnett Multiple Comparison Test |

## Point Estimate Summary

| Analysis ID | Endpoint | Level | µg/L | 95% LCL | 95% UCL | TU | Method |
|---|---|---|---|---|---|---|---|
| 01-5623-0508 | 7d Survival Rate | EC50 | 7.282 | 6.526 | 8.126 | | Spearman-Kärber |
| 19-0014-0671 | Reproduction | IC5 | 2.413 | 1.738 | 2.541 | | Linear Interpolation (ICPIN) |
| | | IC10 | 2.827 | 2.331 | 3.081 | | |
| | | IC15 | 3.24 | 2.736 | 3.622 | | |
| | | IC20 | 3.654 | 3.178 | 4.163 | | |
| | | IC25 | 4.067 | 3.599 | 4.704 | | |
| | | IC40 | 5.304 | 4.728 | 5.829 | | |
| | | IC50 | 6.123 | 5.611 | 6.633 | | |

## Test Acceptability

| Analysis ID | Endpoint | Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|---|---|
| 01-5623-0508 | 7d Survival Rate | Control Resp | 1 | 0.8 - NL | Yes | Passes Acceptability Criteria |
| 09-0104-4700 | 7d Survival Rate | Control Resp | 1 | 0.8 - NL | Yes | Passes Acceptability Criteria |
| 07-4810-2665 | Reproduction | Control Resp | 20.5 | 15 - NL | Yes | Passes Acceptability Criteria |
| 19-0014-0671 | Reproduction | Control Resp | 20.5 | 15 - NL | Yes | Passes Acceptability Criteria |
| 07-4810-2665 | Reproduction | PMSD | 0.1823 | 0.13 - 0.47 | Yes | Passes Acceptability Criteria |

## 7d Survival Rate Summary

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Min | Max | Std Err | Std Dev | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 10 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% |
| 1 | | 10 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% |
| 2 | | 10 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% |
| 5 | | 10 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% |
| 7.5 | | 10 | 0.5 | 0.3032 | 0.6968 | 0 | 1 | 0.1667 | 0.527 | 105.4% | 50.0% |
| 10 | | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

## Reproduction Summary

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Min | Max | Std Err | Std Dev | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 10 | 20.5 | 18.78 | 22.22 | 14 | 26 | 1.455 | 4.601 | 22.44% | 0.0% |
| 1 | | 10 | 23.8 | 22.01 | 25.59 | 13 | 29 | 1.519 | 4.803 | 20.18% | -16.1% |
| 2 | | 10 | 23.5 | 22.37 | 24.63 | 18 | 29 | 0.9574 | 3.028 | 12.88% | -14.63% |
| 5 | | 10 | 14.4 | 13.34 | 15.46 | 11 | 20 | 0.8969 | 2.836 | 19.7% | 29.76% |
| 7.5 | | 10 | 7.5 | 6.303 | 8.697 | 4 | 12 | 1.014 | 3.206 | 42.75% | 63.41% |
| 10 | | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

Ceriodaphnia 7-d Survival and Reproduction Test — Aquatic Consulting & Testing, Inc.

**7d Survival Rate Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Rep 5 | Rep 6 | Rep 7 | Rep 8 | Rep 9 | Rep 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7.5 | | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 10 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Reproduction Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Rep 5 | Rep 6 | Rep 7 | Rep 8 | Rep 9 | Rep 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 15 | 21 | 24 | 15 | 18 | 24 | 23 | 26 | 14 | 25 |
| 1 | | 13 | 26 | 29 | 26 | 24 | 20 | 27 | 27 | 20 | 26 |
| 2 | | 24 | 18 | 29 | 25 | 23 | 25 | 22 | 26 | 21 | 22 |
| 5 | | 20 | 11 | 15 | 12 | 16 | 17 | 11 | 13 | 14 | 15 |
| 7.5 | | 8 | 9 | 4 | 4 | 12 | 11 | 10 | 9 | 4 | 4 |
| 10 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:12 (p 1 of 3)
Test Code: CS08-12CPp | 03-9175-7414

**Fathead Minnow 7-d Larval Survival and Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 08-7279-0963 | **Endpoint:** | 7d Survival Rate | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:10 | **Analysis:** | Parametric-Control vs Treatments | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 06-8984-5117 | **Test Type:** | Growth-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 14:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 14:00 | **Species:** | Pimephales promelas | **Brine:** | |
| **Duration:** | 7d 0h | **Source:** | Aquatic Biosystems, CA | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 20-9197-3664 | **Code:** | 7CB0FC20 | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 14:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 14:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

| Data Transform | Zeta | Alt Hyp | Trials | Seed | PMSD | NOEL | LOEL | TOEL | TU |
|---|---|---|---|---|---|---|---|---|---|
| Angular (Corrected) | NA | C > T | NA | NA | 15.2% | 30 | 40 | 34.64 | |

**Dunnett Multiple Comparison Test**

| Control | vs | C-µg/L | Test Stat | Critical | MSD | DF | P-Value | P-Type | Decision(α:5%) |
|---|---|---|---|---|---|---|---|---|---|
| Dilution Water | | 10 | -0.05726 | 2.356 | 0.217 | 6 | 0.8180 | CDF | Non-Significant Effect |
| | | 20 | 0.7711 | 2.356 | 0.217 | 6 | 0.4830 | CDF | Non-Significant Effect |
| | | 30 | 0.3855 | 2.356 | 0.217 | 6 | 0.6540 | CDF | Non-Significant Effect |
| | | 40* | 5.924 | 2.356 | 0.217 | 6 | <0.0001 | CDF | Significant Effect |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 0.95 | 0.8 - NL | Yes | Passes Acceptability Criteria |

**ANOVA Table**

| Source | Sum Squares | Mean Square | DF | F Stat | P-Value | Decision(α:5%) |
|---|---|---|---|---|---|---|
| Between | 0.8798087 | 0.2199522 | 4 | 12.99 | <0.0001 | Significant Effect |
| Error | 0.253997 | 0.01693313 | 15 | | | |
| Total | 1.133806 | | 19 | | | |

**Distributional Tests**

| Attribute | Test | Test Stat | Critical | P-Value | Decision(α:1%) |
|---|---|---|---|---|---|
| Variances | Mod Levene Equality of Variance | 2.278 | 4.893 | 0.1090 | Equal Variances |
| Variances | Levene Equality of Variance | 7.279 | 4.893 | 0.0018 | Unequal Variances |
| Distribution | Shapiro-Wilk W Normality | 0.9269 | 0.866 | 0.1343 | Normal Distribution |
| Distribution | Kolmogorov-Smirnov D | 0.1951 | 0.2235 | 0.0445 | Normal Distribution |
| Distribution | D'Agostino Skewness | 1.086 | 2.576 | 0.2774 | Normal Distribution |
| Distribution | D'Agostino Kurtosis | 0.8619 | 2.576 | 0.3888 | Normal Distribution |
| Distribution | D'Agostino-Pearson K2 Omnibus | 1.922 | 9.21 | 0.3824 | Normal Distribution |
| Distribution | Anderson-Darling A2 Normality | 0.6344 | 3.878 | 0.0988 | Normal Distribution |

**7d Survival Rate Summary**

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 0.95 | 0.8581 | 1 | 0.95 | 0.9 | 1 | 0.02887 | 6.08% | 0.0% |
| 10 | | 4 | 0.95 | 0.7909 | 1 | 1 | 0.8 | 1 | 0.05 | 10.53% | 0.0% |
| 20 | | 4 | 0.9 | 0.7163 | 1 | 0.9 | 0.8 | 1 | 0.05774 | 12.83% | 5.26% |
| 30 | | 4 | 0.925 | 0.7727 | 1 | 0.95 | 0.8 | 1 | 0.04787 | 10.35% | 2.63% |
| 40 | | 4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0.0% | 47.37% |
| 50 | | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:23 (p 1 of 1)
Test Code: CS08-12CCd | 09-7704-7591

**Ceriodaphnia 7-d Survival and Reproduction Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 01-5623-0508 | **Endpoint:** | 7d Survival Rate | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:15 | **Analysis:** | Untrimmed Spearman-Kärber | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 10-1097-2582 | **Test Type:** | Reproduction-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 07:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 06:30 | **Species:** | Ceriodaphnia dubia | **Brine:** | |
| **Duration:** | 7d | **Source:** | In-House Culture | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 19-1576-1036 | **Code:** | 7230318C | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 07:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 07:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

**Spearman-Kärber Estimates**

| Threshold Option | Threshold | Trim | Mu | Sigma | EC50 | 95% LCL | 95% UCL |
|---|---|---|---|---|---|---|---|
| Control Threshold | 0 | 0.00% | 0.8623 | 0.0238 | 7.282 | 6.526 | 8.126 |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 1 | 0.8 - NL | Yes | Passes Acceptability Criteria |

**7d Survival Rate Summary**

| | | | Calculated Variate(A/B) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C-µg/L | Control Type | Count | Mean | Min | Max | Std Err | Std Dev | CV% | %Effect | A | B |
| 0 | Dilution Water | 10 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% | 10 | 10 |
| 1 | | 10 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% | 10 | 10 |
| 2 | | 10 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% | 10 | 10 |
| 5 | | 10 | 1 | 1 | 1 | 0 | 0 | 0.0% | 0.0% | 10 | 10 |
| 7.5 | | 10 | 0.5 | 0 | 1 | 0.1667 | 0.527 | 105.4% | 50.0% | 5 | 10 |
| 10 | | 10 | 0 | 0 | 0 | 0 | 0 | | 100.0% | 0 | 10 |

**7d Survival Rate Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Rep 5 | Rep 6 | Rep 7 | Rep 8 | Rep 9 | Rep 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7.5 | | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 10 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:23 (p 1 of 1)
Test Code: CS08-12CCd | 09-7704-7591

**Ceriodaphnia 7-d Survival and Reproduction Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 09-0104-4700 | **Endpoint:** | 7d Survival Rate | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:15 | **Analysis:** | STP 2x2 Contingency Tables | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 10-1097-2582 | **Test Type:** | Reproduction-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 07:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 06:30 | **Species:** | Ceriodaphnia dubia | **Brine:** | |
| **Duration:** | 7d | **Source:** | In-House Culture | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 19-1576-1036 | **Code:** | 7230318C | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 07:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 07:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

| Data Transform | Zeta | Alt Hyp | Trials | Seed | NOEL | LOEL | TOEL | TU |
|---|---|---|---|---|---|---|---|---|
| Untransformed | | C > T | NA | NA | 7.5 | 10 | 8.66 | |

**Fisher Exact/Bonferroni-Holm Test**

| Control | vs | C-µg/L | Test Stat | P-Value | P-Type | Decision(α:5%) |
|---|---|---|---|---|---|---|
| Dilution Water | | 1 | 1 | 1.0000 | Exact | Non-Significant Effect |
| | | 2 | 1 | 1.0000 | Exact | Non-Significant Effect |
| | | 5 | 1 | 1.0000 | Exact | Non-Significant Effect |
| | | 7.5 | 0.01625 | 0.0650 | Exact | Non-Significant Effect |
| | | 10 | 5.413E-06 | <0.0001 | Exact | Significant Effect |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 1 | 0.8 - NL | Yes | Passes Acceptability Criteria |

**Data Summary**

| C-µg/L | Control Type | NR | R | NR + R | Prop NR | Prop R | %Effect |
|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 10 | 0 | 10 | 1 | 0 | 0.0% |
| 1 | | 10 | 0 | 10 | 1 | 0 | 0.0% |
| 2 | | 10 | 0 | 10 | 1 | 0 | 0.0% |
| 5 | | 10 | 0 | 10 | 1 | 0 | 0.0% |
| 7.5 | | 5 | 5 | 10 | 0.5 | 0.5 | 50.0% |
| 10 | | 0 | 10 | 10 | 0 | 1 | 100.0% |

**7d Survival Rate Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Rep 5 | Rep 6 | Rep 7 | Rep 8 | Rep 9 | Rep 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7.5 | | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 10 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:23 (p 1 of 1)
Test Code: CS08-12CCd | 09-7704-7591

**Ceriodaphnia 7-d Survival and Reproduction Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 07-4810-2665 | **Endpoint:** | Reproduction | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:15 | **Analysis:** | Parametric-Control vs Treatments | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 10-1097-2582 | **Test Type:** | Reproduction-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 07:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 06:30 | **Species:** | Ceriodaphnia dubia | **Brine:** | |
| **Duration:** | 7d | **Source:** | In-House Culture | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 19-1576-1036 | **Code:** | 7230318C | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 07:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 07:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

| Data Transform | Zeta | Alt Hyp | Trials | Seed | PMSD | NOEL | LOEL | TOEL | TU |
|---|---|---|---|---|---|---|---|---|---|
| Untransformed | NA | C > T | NA | NA | 18.2% | 2 | 5 | 3.162 | |

**Dunnett Multiple Comparison Test**

| Control | vs | C-µg/L | Test Stat | Critical | MSD | DF | P-Value | P-Type | Decision(α:5%) |
|---|---|---|---|---|---|---|---|---|---|
| Dilution Water | | 1 | -1.883 | 2.133 | 3.738 | 18 | 0.9971 | CDF | Non-Significant Effect |
| | | 2 | -1.712 | 2.133 | 3.738 | 18 | 0.9950 | CDF | Non-Significant Effect |
| | | 5* | 3.48 | 2.133 | 3.738 | 18 | 0.0019 | CDF | Significant Effect |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 20.5 | 15 - NL | Yes | Passes Acceptability Criteria |
| PMSD | 0.1823 | 0.13 - 0.47 | Yes | Passes Acceptability Criteria |

**ANOVA Table**

| Source | Sum Squares | Mean Square | DF | F Stat | P-Value | Decision(α:5%) |
|---|---|---|---|---|---|---|
| Between | 570.9 | 190.3 | 3 | 12.39 | <0.0001 | Significant Effect |
| Error | 553 | 15.36111 | 36 | | | |
| Total | 1123.9 | | 39 | | | |

**Distributional Tests**

| Attribute | Test | Test Stat | Critical | P-Value | Decision(α:1%) |
|---|---|---|---|---|---|
| Variances | Bartlett Equality of Variance | 3.75 | 11.34 | 0.2897 | Equal Variances |
| Variances | Mod Levene Equality of Variance | 0.868 | 4.377 | 0.4666 | Equal Variances |
| Variances | Levene Equality of Variance | 1.984 | 4.377 | 0.1337 | Equal Variances |
| Distribution | Shapiro-Wilk W Normality | 0.9576 | 0.9236 | 0.1387 | Normal Distribution |
| Distribution | Kolmogorov-Smirnov D | 0.1048 | 0.1617 | 0.3110 | Normal Distribution |
| Distribution | D'Agostino Skewness | 1.749 | 2.576 | 0.0802 | Normal Distribution |
| Distribution | D'Agostino Kurtosis | 0.5908 | 2.576 | 0.5546 | Normal Distribution |
| Distribution | D'Agostino-Pearson K2 Omnibus | 3.409 | 9.21 | 0.1819 | Normal Distribution |
| Distribution | Anderson-Darling A2 Normality | 0.485 | 3.878 | 0.2311 | Normal Distribution |

**Reproduction Summary**

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 10 | 20.5 | 17.21 | 23.79 | 22 | 14 | 26 | 1.455 | 22.44% | 0.0% |
| 1 | | 10 | 23.8 | 20.36 | 27.24 | 26 | 13 | 29 | 1.519 | 20.18% | -16.1% |
| 2 | | 10 | 23.5 | 21.33 | 25.67 | 23.5 | 18 | 29 | 0.9574 | 12.88% | -14.63% |
| 5 | | 10 | 14.4 | 12.37 | 16.43 | 14.5 | 11 | 20 | 0.8969 | 19.7% | 29.76% |

**Reproduction Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Rep 5 | Rep 6 | Rep 7 | Rep 8 | Rep 9 | Rep 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 15 | 21 | 24 | 15 | 18 | 24 | 23 | 26 | 14 | 25 |
| 1 | | 13 | 26 | 29 | 26 | 24 | 20 | 27 | 27 | 20 | 26 |
| 2 | | 24 | 18 | 29 | 25 | 23 | 25 | 22 | 26 | 21 | 22 |
| 5 | | 20 | 11 | 15 | 12 | 16 | 17 | 11 | 13 | 14 | 15 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:23 (p 1 of 1)
Test Code: CS08-12CCd | 09-7704-7591

**Ceriodaphnia 7-d Survival and Reproduction Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| Analysis ID: | 19-0014-0671 | Endpoint: | Reproduction | CETIS Version: | CETISv1.8.5 |
| Analyzed: | 14 Sep-12 11:15 | Analysis: | Linear Interpolation (ICPIN) | Official Results: | Yes |

| | | | | | |
|---|---|---|---|---|---|
| Batch ID: | 10-1097-2582 | Test Type: | Reproduction-Survival (7d) | Analyst: | Elizabeth Atkinson |
| Start Date: | 21 Aug-12 07:00 | Protocol: | EPA/821/R-02-013 (2002) | Diluent: | Mod-Hard Synthetic Water |
| Ending Date: | 28 Aug-12 06:30 | Species: | Ceriodaphnia dubia | Brine: | |
| Duration: | 7d | Source: | In-House Culture | Age: | |

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: | 19-1576-1036 | Code: | 7230318C | Client: | Aquatic Consulting & Testing, Inc. |
| Sample Date: | 21 Aug-12 07:00 | Material: | Copper sulfate | Project: | Reference Toxicant |
| Receive Date: | 21 Aug-12 07:00 | Source: | Reference Toxicant | | |
| Sample Age: | NA | Station: | | | |

**Linear Interpolation Options**

| X Transform | Y Transform | Seed | Resamples | Exp 95% CL | Method |
|---|---|---|---|---|---|
| Linear | Linear | 0 | 280 | Yes | Two-Point Interpolation |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 20.5 | 15 - NL | Yes | Passes Acceptability Criteria |

**Point Estimates**

| Level | µg/L | 95% LCL | 95% UCL |
|---|---|---|---|
| IC5 | 2.413 | 1.738 | 2.541 |
| IC10 | 2.827 | 2.331 | 3.081 |
| IC15 | 3.24 | 2.736 | 3.622 |
| IC20 | 3.654 | 3.178 | 4.163 |
| IC25 | 4.067 | 3.599 | 4.704 |
| IC40 | 5.304 | 4.728 | 5.829 |
| IC50 | 6.123 | 5.611 | 6.633 |

**Reproduction Summary**

| | | | Calculated Variate | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C-µg/L | Control Type | Count | Mean | Min | Max | Std Err | Std Dev | CV% | %Effect |
| 0 | Dilution Water | 10 | 20.5 | 14 | 26 | 1.455 | 4.601 | 22.44% | 0.0% |
| 1 | | 10 | 23.8 | 13 | 29 | 1.519 | 4.803 | 20.18% | -16.1% |
| 2 | | 10 | 23.5 | 18 | 29 | 0.9574 | 3.028 | 12.88% | -14.63% |
| 5 | | 10 | 14.4 | 11 | 20 | 0.8969 | 2.836 | 19.7% | 29.76% |
| 7.5 | | 10 | 7.5 | 4 | 12 | 1.014 | 3.206 | 42.75% | 63.41% |
| 10 | | 10 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

**Reproduction Detail**

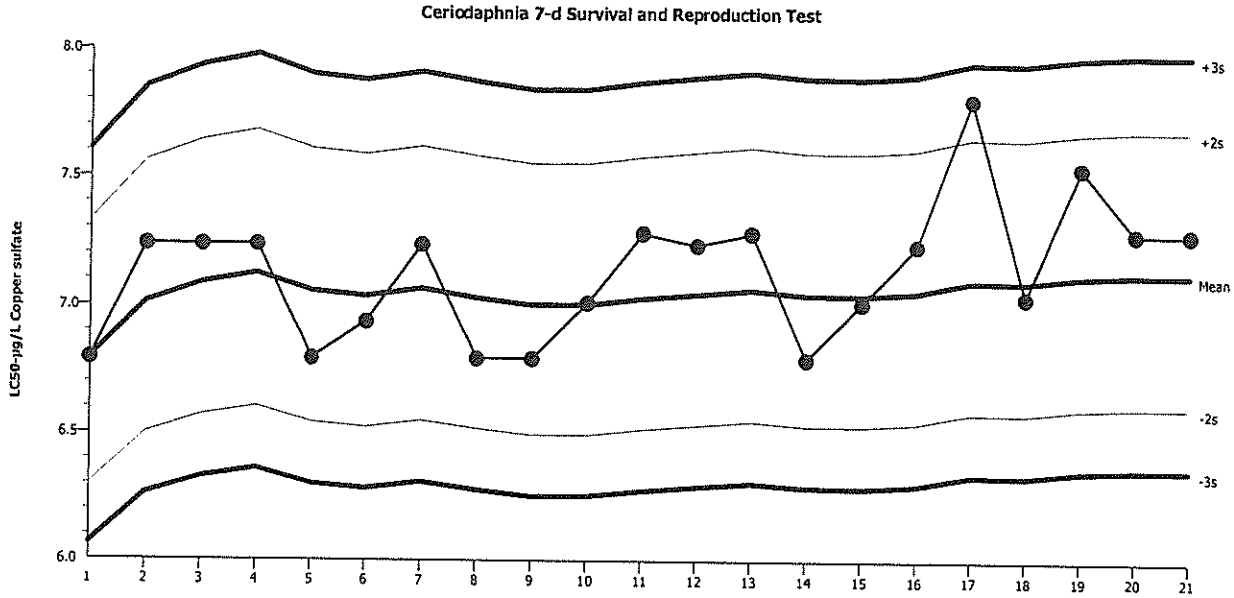
| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 | Rep 5 | Rep 6 | Rep 7 | Rep 8 | Rep 9 | Rep 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 15 | 21 | 24 | 15 | 18 | 24 | 23 | 26 | 14 | 25 |
| 1 | | 13 | 26 | 29 | 26 | 24 | 20 | 27 | 27 | 20 | 26 |
| 2 | | 24 | 18 | 29 | 25 | 23 | 25 | 22 | 26 | 21 | 22 |
| 5 | | 20 | 11 | 15 | 12 | 16 | 17 | 11 | 13 | 14 | 15 |
| 7.5 | | 8 | 9 | 4 | 4 | 12 | 11 | 10 | 9 | 4 | 4 |
| 10 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:19 ( 1 of 1)

Ceriodaphnia 7-d Survival and Reproduction Test — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Reproduction-Survival (7d) | **Organism:** | Ceriodaphnia dubia (Water Flea) | **Material:** | Copper sulfate |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | 7d Survival Rate | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 7.121 | **Count:** | 20 | **-2s Warning Limit:** | 6.605 | **-3s Action Limit:** | 6.361 |
| **Sigma:** | NA | **CV:** | 3.85% | **+2s Warning Limit:** | 7.683 | **+3s Action Limit:** | 7.978 |

## Quality Control Data

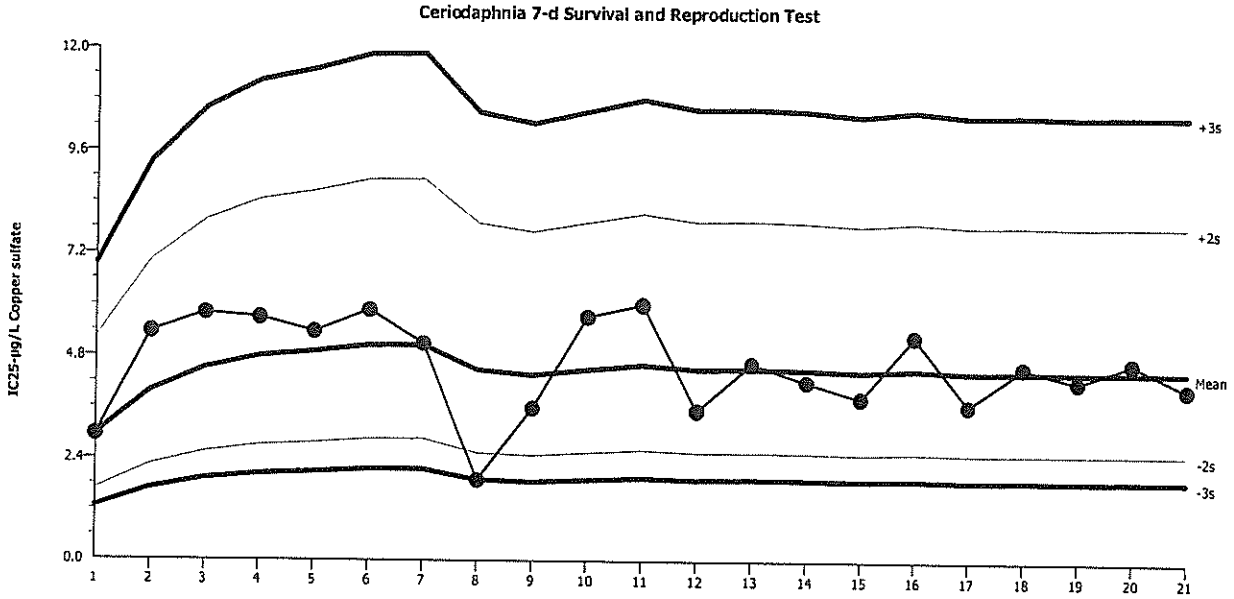
| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | Mar | 8 | 9:45 | 6.794 | -0.327 | -1.245 | | | 10-3167-2844 | 08-5802-7575 |
| 2 | | | 16 | 7:00 | 7.236 | 0.1154 | 0.4255 | | | 01-7892-3412 | 06-4762-8118 |
| 3 | | Apr | 5 | 8:00 | 7.236 | 0.1154 | 0.4255 | | | 09-3537-6746 | 03-1638-2669 |
| 4 | | May10 | | 9:00 | 7.236 | 0.1154 | 0.4255 | | | 15-0817-1739 | 01-6750-3703 |
| 5 | | Jun | 7 | 8:00 | 6.794 | -0.327 | -1.245 | | | 09-7932-6955 | 06-1732-0388 |
| 6 | | Jul | 12 | 6:00 | 6.937 | -0.1838 | -0.6922 | | | 12-0703-6688 | 13-8068-2437 |
| 7 | | Aug | 2 | 7:00 | 7.236 | 0.1154 | 0.4255 | | | 14-0292-6496 | 06-3846-8430 |
| 8 | | Sep | 7 | 9:00 | 6.794 | -0.327 | -1.245 | | | 03-7022-3709 | 04-4342-4280 |
| 9 | | | 27 | 8:30 | 6.794 | -0.327 | -1.245 | | | 09-6267-8081 | 08-8166-1744 |
| 10 | | Oct | 4 | 7:00 | 7.012 | -0.1085 | -0.4064 | | | 09-0076-8613 | 13-6221-1294 |
| 11 | | Nov | 12 | 9:30 | 7.282 | 0.1617 | 0.5946 | | | 20-0375-2976 | 00-2065-2560 |
| 12 | | Dec | 6 | 10:00 | 7.236 | 0.1154 | 0.4255 | | | 06-9273-3856 | 03-4831-5628 |
| 13 | 2012 | Jan | 17 | 9:00 | 7.282 | 0.1617 | 0.5946 | | | 14-5681-0061 | 07-3108-6657 |
| 14 | | Feb | 21 | 10:00 | 6.794 | -0.327 | -1.245 | | | 09-5407-4466 | 17-6022-5226 |
| 15 | | Mar | 6 | 8:00 | 7.012 | -0.1085 | -0.4064 | | | 14-7170-7386 | 08-6670-1959 |
| 16 | | Apr | 3 | 9:00 | 7.236 | 0.1154 | 0.4255 | | | 00-4609-8685 | 12-2653-8046 |
| 17 | | May1 | | 9:00 | 7.805 | 0.6844 | 2.43 | (+) | | 13-5638-2061 | 01-5331-0232 |
| 18 | | | 8 | 8:00 | 7.034 | -0.08635 | -0.323 | | | 15-2561-0639 | 12-3951-7677 |
| 19 | | Jun | 5 | 7:00 | 7.539 | 0.4185 | 1.512 | | | 08-4775-8256 | 14-1989-4725 |
| 20 | | Jul | 10 | 6:00 | 7.282 | 0.1617 | 0.5946 | | | 07-6567-4404 | 12-1290-3127 |
| 21 | | Aug | 21 | 7:00 | 7.282 | 0.1617 | 0.5946 | | | 09-7704-7591 | 01-5623-0508 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:19 ( 1 of 1)

Ceriodaphnia 7-d Survival and Reproduction Test — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| Test Type: | Reproduction-Survival (7d) | Organism: | Ceriodaphnia dubia (Water Flea) | Material: | Copper sulfate |
| Protocol: | EPA/821/R-02-013 (2002) | Endpoint: | Reproduction | Source: | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mean: | 4.45 | Count: | 20 | -2s Warning Limit: | 2.517 | -3s Action Limit: | 1.893 |
| Sigma: | NA | CV: | 32.90% | +2s Warning Limit: | 7.863 | +3s Action Limit: | 10.45 |

## Quality Control Data

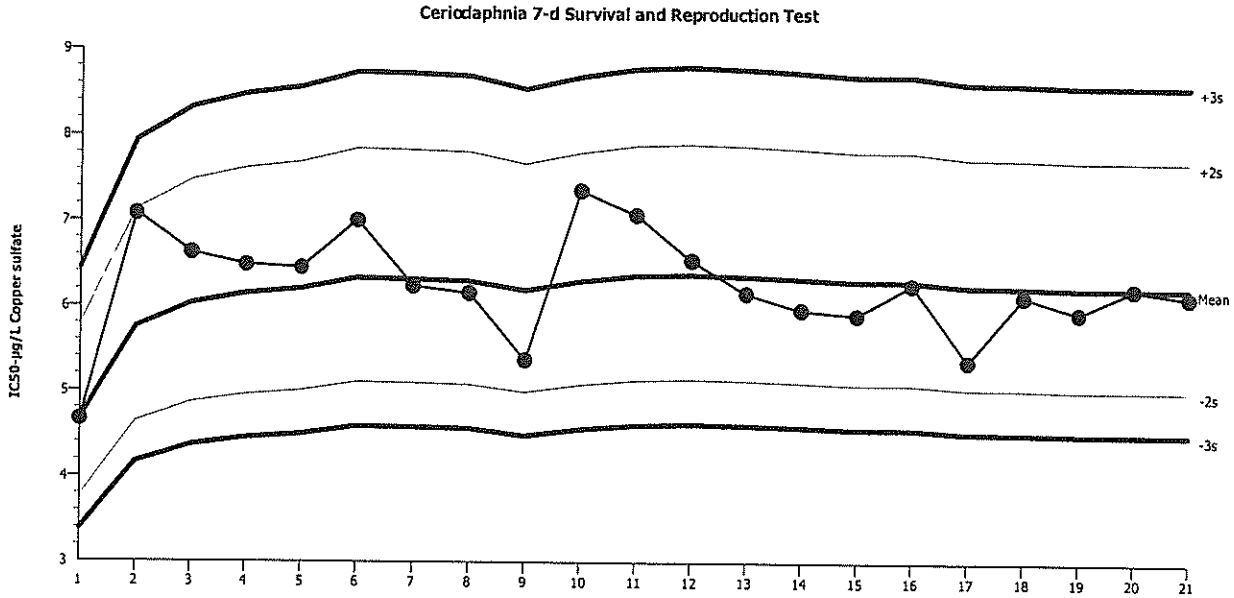
| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | Mar | 8 | 9:45 | 2.959 | -1.492 | -1.433 | | | 10-3167-2844 | 11-7357-7922 |
| 2 | | | 16 | 7:00 | 5.368 | 0.9172 | 0.658 | | | 01-7892-3412 | 02-5774-0639 |
| 3 | | Apr | 5 | 8:00 | 5.813 | 1.363 | 0.9381 | | | 09-3537-6746 | 00-4114-7543 |
| 4 | | May10 | | 9:00 | 5.701 | 1.25 | 0.8694 | | | 15-0817-1739 | 08-7906-0841 |
| 5 | | Jun | 7 | 8:00 | 5.373 | 0.9223 | 0.6613 | | | 09-7932-6955 | 06-7513-5863 |
| 6 | | Jul | 12 | 6:00 | 5.878 | 1.428 | 0.9771 | | | 12-0703-6688 | 10-5830-6435 |
| 7 | | Aug | 2 | 7:00 | 5.096 | 0.6453 | 0.4754 | | | 14-0292-6496 | 08-3078-9468 |
| 8 | | Sep | 7 | 9:00 | 1.902 | -2.548 | -2.985 | (-) | | 03-7022-3709 | 11-8701-8833 |
| 9 | | | 27 | 8:30 | 3.586 | -0.8642 | -0.7581 | | | 09-6267-8081 | 18-3216-7208 |
| 10 | | Oct | 4 | 7:00 | 5.731 | 1.28 | 0.8877 | | | 09-0076-8613 | 05-2332-2240 |
| 11 | | Nov | 12 | 9:30 | 6.014 | 1.564 | 1.057 | | | 20-0375-2976 | 09-3080-6741 |
| 12 | | Dec | 6 | 10:00 | 3.539 | -0.911 | -0.8042 | | | 06-9273-3856 | 12-4284-0695 |
| 13 | 2012 | Jan | 17 | 9:00 | 4.645 | 0.1943 | 0.1501 | | | 14-5681-0061 | 05-4020-8348 |
| 14 | | Feb | 21 | 10:00 | 4.216 | -0.2345 | -0.1901 | | | 09-5407-4466 | 10-0376-9190 |
| 15 | | Mar | 6 | 8:00 | 3.832 | -0.6187 | -0.5256 | | | 14-7170-7386 | 04-2920-4726 |
| 16 | | Apr | 3 | 9:00 | 5.28 | 0.8292 | 0.5999 | | | 00-4609-8685 | 13-2721-7929 |
| 17 | | May1 | | 9:00 | 3.664 | -0.7864 | -0.6827 | | | 13-5638-2061 | 16-8920-4992 |
| 18 | | | 8 | 8:00 | 4.563 | 0.1121 | 0.08733 | | | 15-2561-0639 | 11-8897-7426 |
| 19 | | Jun | 5 | 7:00 | 4.23 | -0.2207 | -0.1786 | | | 08-4775-8256 | 14-5053-2237 |
| 20 | | Jul | 10 | 6:00 | 4.662 | 0.2121 | 0.1635 | | | 07-6567-4404 | 04-6412-2191 |
| 21 | | Aug | 21 | 7:00 | 4.067 | -0.3834 | -0.3163 | | | 09-7704-7591 | 19-0014-0671 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:19 ( 1 of 1)

**Ceriodaphnia 7-d Survival and Reproduction Test** — **Aquatic Consulting & Testing, Inc.**

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Reproduction-Survival (7d) | **Organism:** | Ceriodaphnia dubia (Water Flea) | **Material:** | Copper sulfate |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Reproduction | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 6.215 | **Count:** | 20 | **-2s Warning Limit:** | 5.012 | **-3s Action Limit:** | 4.502 |
| **Sigma:** | NA | **CV:** | 11.30% | **+2s Warning Limit:** | 7.705 | **+3s Action Limit:** | 8.58 |

**Quality Control Data**

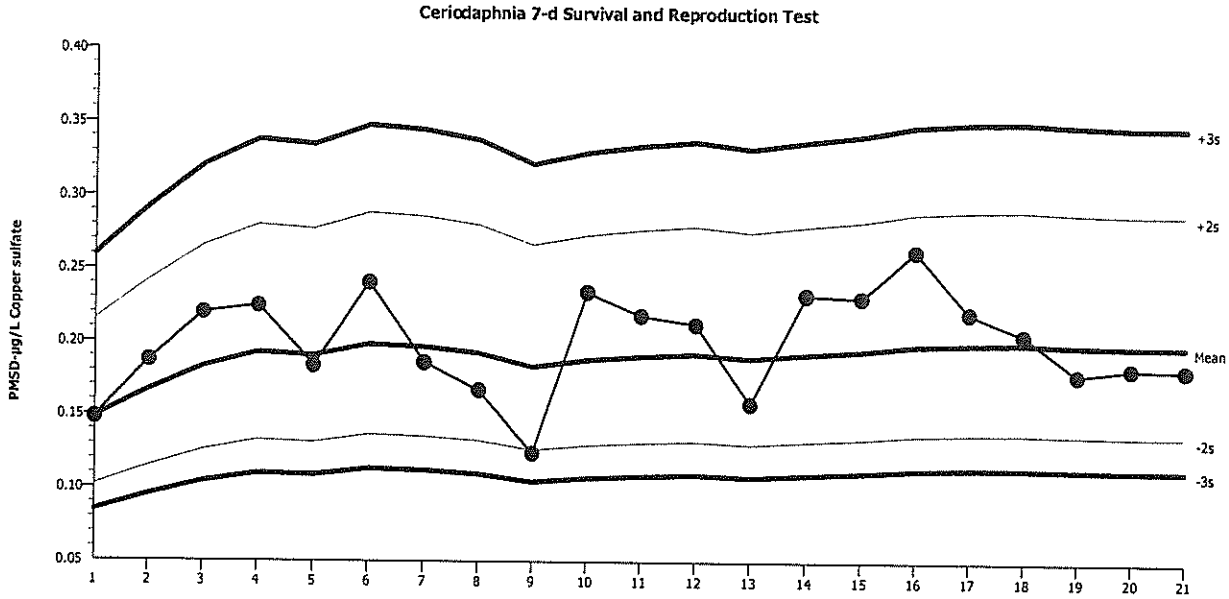
| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | Mar | 8 | 9:45 | 4.667 | -1.548 | -2.664 | (-) | | 10-3167-2844 | 11-7357-7922 |
| 2 | | | 16 | 7:00 | 7.083 | 0.8681 | 1.216 | | | 01-7892-3412 | 02-5774-0639 |
| 3 | | Apr | 5 | 8:00 | 6.627 | 0.4117 | 0.5966 | | | 09-3537-6746 | 00-4114-7543 |
| 4 | | May10 | | 9:00 | 6.482 | 0.2671 | 0.3914 | | | 15-0817-1739 | 08-7906-0841 |
| 5 | | Jun | 7 | 8:00 | 6.449 | 0.2336 | 0.3432 | | | 09-7932-6955 | 06-7513-5863 |
| 6 | | Jul | 12 | 6:00 | 7.007 | 0.7914 | 1.115 | | | 12-0703-6688 | 10-5830-6435 |
| 7 | | Aug | 2 | 7:00 | 6.235 | 0.01977 | 0.02955 | | | 14-0292-6496 | 08-3078-9468 |
| 8 | | Sep | 7 | 9:00 | 6.153 | -0.06262 | -0.09419 | | | 03-7022-3709 | 11-8701-8833 |
| 9 | | | 27 | 8:30 | 5.365 | -0.85 | -1.368 | | | 09-6267-8081 | 18-3216-7208 |
| 10 | | Oct | 4 | 7:00 | 7.359 | 1.144 | 1.572 | | | 09-0076-8613 | 05-2332-2240 |
| 11 | | Nov | 12 | 9:30 | 7.075 | 0.8603 | 1.206 | | | 20-0375-2976 | 09-3080-6741 |
| 12 | | Dec | 6 | 10:00 | 6.544 | 0.3289 | 0.4797 | | | 06-9273-3856 | 12-4284-0695 |
| 13 | 2012 | Jan | 17 | 9:00 | 6.157 | -0.0583 | -0.08767 | | | 14-5681-0061 | 05-4020-8348 |
| 14 | | Feb | 21 | 10:00 | 5.962 | -0.2532 | -0.3869 | | | 09-5407-4466 | 10-0376-9190 |
| 15 | | Mar | 6 | 8:00 | 5.904 | -0.3114 | -0.4781 | | | 14-7170-7386 | 04-2920-4726 |
| 16 | | Apr | 3 | 9:00 | 6.261 | 0.04575 | 0.06823 | | | 00-4609-8685 | 13-2721-7929 |
| 17 | | May1 | | 9:00 | 5.359 | -0.8562 | -1.379 | | | 13-5638-2061 | 16-8920-4992 |
| 18 | | | 8 | 8:00 | 6.125 | -0.09021 | -0.136 | | | 15-2561-0639 | 11-8897-7426 |
| 19 | | Jun | 5 | 7:00 | 5.93 | -0.285 | -0.4366 | | | 08-4775-8256 | 14-5053-2237 |
| 20 | | Jul | 10 | 6:00 | 6.216 | 0.000473 | 0.0007084 | | | 07-6567-4404 | 04-6412-2191 |
| 21 | | Aug | 21 | 7:00 | 6.123 | -0.09203 | -0.1388 | | | 09-7704-7591 | 19-0014-0671 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:19 ( 1 of 1)

**Ceriodaphnia 7-d Survival and Reproduction Test** — **Aquatic Consulting & Testing, Inc.**

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Reproduction-Survival (7d) | **Organism:** | Ceriodaphnia dubia (Water Flea) | **Material:** | Copper sulfate |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Reproduction | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 0.1979 | **Count:** | 20 | **-2s Warning Limit:** | 0.1361 | **-3s Action Limit:** | 0.1128 |
| **Sigma:** | NA | **CV:** | 20.60% | **+2s Warning Limit:** | 0.288 | **+3s Action Limit:** | 0.3474 |

**Quality Control Data**

| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | Mar | 8 | 9:45 | 0.1481 | -0.04983 | -1.548 | | | 10-3167-2844 | 11-9117-2571 |
| 2 | | | 16 | 7:00 | 0.1874 | -0.0105 | -0.291 | | | 01-7892-3412 | 09-6155-2283 |
| 3 | | Apr | 5 | 8:00 | 0.2204 | 0.02248 | 0.574 | | | 09-3537-6746 | 03-0197-3447 |
| 4 | | May10 | | 9:00 | 0.2249 | 0.027 | 0.6824 | | | 15-0817-1739 | 10-3872-0826 |
| 5 | | Jun | 7 | 8:00 | 0.1837 | -0.01418 | -0.3967 | | | 09-7932-6955 | 13-9343-7796 |
| 6 | | Jul | 12 | 6:00 | 0.241 | 0.04311 | 1.052 | | | 12-0703-6688 | 04-4589-9889 |
| 7 | | Aug | 2 | 7:00 | 0.186 | -0.0119 | -0.3308 | | | 14-0292-6496 | 02-6099-5048 |
| 8 | | Sep | 7 | 9:00 | 0.1671 | -0.03082 | -0.9033 | | | 03-7022-3709 | 05-3341-3322 |
| 9 | | | 27 | 8:30 | 0.124 | -0.07392 | -2.496 | (-) | | 09-6267-8081 | 14-7600-2802 |
| 10 | | Oct | 4 | 7:00 | 0.2347 | 0.03682 | 0.9105 | | | 09-0076-8613 | 17-5011-4545 |
| 11 | | Nov | 12 | 9:30 | 0.2187 | 0.02078 | 0.5329 | | | 20-0375-2976 | 07-8461-9970 |
| 12 | | Dec | 6 | 10:00 | 0.2128 | 0.01493 | 0.3881 | | | 06-9273-3856 | 09-5937-2227 |
| 13 | 2012 | Jan | 17 | 9:00 | 0.1583 | -0.03957 | -1.191 | | | 14-5681-0061 | 09-9788-1374 |
| 14 | | Feb | 21 | 10:00 | 0.233 | 0.03509 | 0.8711 | | | 09-5407-4466 | 08-7236-5029 |
| 15 | | Mar | 6 | 8:00 | 0.2313 | 0.03338 | 0.8318 | | | 14-7170-7386 | 10-5341-9468 |
| 16 | | Apr | 3 | 9:00 | 0.2632 | 0.06531 | 1.522 | | | 00-4609-8685 | 02-1864-5966 |
| 17 | | May1 | | 9:00 | 0.2208 | 0.02285 | 0.5832 | | | 13-5638-2061 | 09-8551-2217 |
| 18 | | | 8 | 8:00 | 0.206 | 0.008135 | 0.215 | | | 15-2561-0639 | 18-9508-7957 |
| 19 | | Jun | 5 | 7:00 | 0.1786 | -0.01932 | -0.5483 | | | 08-4775-8256 | 16-6653-6516 |
| 20 | | Jul | 10 | 6:00 | 0.1831 | -0.0148 | -0.4147 | | | 07-6567-4404 | 12-3982-7131 |
| 21 | | Aug | 21 | 7:00 | 0.1823 | -0.01555 | -0.4367 | | | 09-7704-7591 | 07-4810-2665 |

| | |
|---|---|
| CLIENT/PROJECT NAME | REFERENCE TOXICANT |
| SAMPLE I.D. | Copper sulfate |
| CLIENT I.D | |

| | |
|---|---|
| TEST ORGANISM: | C. dubia — Age: <24 hrs |
| TEST TYPE | 1002.0 |
| TEST START DATE/TIME | 8·21·12 @ 0700 |
| TEST END DATE/TIME | 8·28·12 @ 0630 |
| DILUTION WATER | (synthetic) receiving matched |

SAMPLE TYPE: Grab Composite
From: N/a to ____ @ ____
From: ____ to ____ @ ____
From: ____ to ____ @ ____

SAMPLE CHEMISTRY
Chlorine, mg/L N/a
Alkalinity, mg/L ____
Hardness, mg/L ____
Ammonia-N, mg.L ____

CONCENTRATION: 0.0 µg/L

| Day | Replicate 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of Young | No. of Adults | Young per Adult |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 3 | 0 | 4 | 4 | 3 | 0 | 6 | 6 | 4 | 4 | 4 | 35 | | |
| 4 | 6 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 10 | | |
| 5 | 0 | 8 | 9 | 0 | 0 | 7 | 0 | 10 | 0 | 8 | 42 | | |
| 6 | 9 | 0 | 0 | 12 | 9 | 0 | 8 | 0 | 10 | 0 | 48 | | |
| 7 | 0 | 9 | 11 | 0 | 5 | 11 | 9 | 12 | 0 | 13 | 70 | | |
| 8 | | | | | | | | | | | | | |
| Total | 15 | 21 | 24 | 15 | 18 | 24 | 23 | 26 | 14 | 25 | 205 | 10 | |

CONCENTRATION: 1.0 µg/L

| Day | Replicate 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of Young | No. of Adults | Young per Adult |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 3 | 0 | 4 | 4 | 5 | 0 | 4 | 4 | 0 | 3 | 4 | 28 | | |
| 4 | 6 | 0 | 0 | 0 | 4 | 0 | 0 | 7 | 0 | 0 | 17 | | |
| 5 | 0 | 8 | 11 | 9 | 10 | 7 | 10 | 0 | 8 | 9 | 62 | | |
| 6 | 7 | 0 | 0 | 0 | 9 | 0 | 0 | 8 | 0 | 0 | 24 | | |
| 7 | 0 | 14 | 14 | 12 | 11 | 9 | 13 | 12 | 9 | 13 | 107 | | |
| 8 | | | | | | | | | | | | | |
| Total | 13 | 26 | 29 | 26 | 24 | 20 | 27 | 27 | 20 | 26 | 238 | 10 | |

CONCENTRATION: 2.0 µg/L

| Day | Replicate 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of Young | No. of Adults | Young per Adult |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 3 | 3 | 0 | 4 | 2 | 2 | 4 | 4 | 3 | 4 | 0 | 26 | | |
| 4 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | | |
| 5 | 9 | 0 | 11 | 7 | 9 | 8 | 9 | 10 | 8 | 0 | 71 | | |
| 6 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 17 | | |
| 7 | 12 | 0 | 14 | 16 | 12 | 13 | 9 | 13 | 9 | 11 | 109 | | |
| 8 | | | | | | | | | | | | | |
| Total | 24 | 18 | 29 | 25 | 23 | 25 | 22 | 26 | 21 | 22 | 235 | 10 | |

CONCENTRATION: 5.0 µg/L

| Day | Replicate 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of Young | No. of Adults | Young per Adult |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 3 | 4 | 1 | 1 | 0 | 2 | 2 | 1 | 0 | 1 | 2 | 14 | | |
| 4 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 5 | 0 | 0 | 8 | | |
| 5 | 8 | 0 | 0 | 0 | 4 | 8 | 4 | 0 | 6 | 0 | 30 | | |
| 6 | 0 | 7 | 14 | 9 | 0 | 0 | 0 | 0 | 0 | 8 | 38 | | |
| 7 | 8 | 3 | 0 | 0 | 10 | 7 | 6 | 8 | 7 | 5 | 54 | | |
| 8 | | | | | | | | | | | | | |
| Total | 20 | 11 | 15 | 12 | 16 | 17 | 11 | 13 | 14 | 15 | 144 | 10 | |

CONCENTRATION: 7.5 µg/L

| Day | Replicate 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of Young | No. of Adults | Young per Adult |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| 3 | 0 | 3 | 0 | 4 | 4 | 2 | 2 | 1 | 0 | 0 | 16 | | |
| 4 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 13 | | |
| 5 | 0 | 0 | 0 | D | 0 | 0 | 0 | 3 | 0 | D | 3 | | |
| 6 | 0 | 6 | D | | 8 | 9 | 4 | 0 | D | | 27 | | |
| 7 | 7 | 0 | | | D | 0 | 4 | 5 | | | 16 | | |
| 8 | | | | | | | | | | | | | |
| Total | 8 | 9 | (4) | (4) | (12) | 11 | 10 | 9 | (4) | (4) | 75 | 5 | |

CONCENTRATION: 10.0 µg/L

| Day | Replicate 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | No. of Young | No. of Adults | Young per Adult |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ⊖ | | | | | | | | | → | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| Total | | | | | | | | | | | ⊖ | ⊖ | |

AQUATIC CONSULTING & TESTING, INC.
ANALYST: Dma

CdRF1

## DAILY CHEMICAL/PHYSICAL MEASUREMENTS

**PROJECT NAME:** Reference Toxicant **ORGANISM:** ___ *Pimephales promelas* ✓ *Ceriodaphnia dubia*

**SAMPLE I.D.:** Copper sulfate **TEST TYPE:** 1002.0

DAY

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 0.0 ug/L | | | | | | | |
| Temp Init | 25.0 | 25.2 | 25.1 | 25.1 | 25.2 | 25.1 | 25.0 |
| Temp Final | 24.9 | 24.9 | 24.7 | 24.7 | 24.8 | 24.8 | 24.9 |
| D.O. Initial | 8.4 | 8.3 | 8.4 | 8.3 | 8.3 | 8.4 | 8.4 |
| D.O. Final | 8.3 | 8.4 | 8.2 | 8.4 | 8.4 | 8.3 | 8.3 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 8.3 | 8.4 | 8.3 | 8.4 | 8.4 | 8.3 | 8.4 |
| Conductivity Init | 300 | 300 | 310 | 300 | 300 | 300 | 310 |
| Conductivity Final | 310 | 320 | 320 | 310 | 290 | 310 | 320 |
| Alkalinity | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| Hardness | 92 | 92 | 92 | 92 | 92 | 92 | 92 |

DAY

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 5.0 ug/L | | | | | | | |
| Temp Init | 25.1 | 25.2 | 25.1 | 25.1 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.0 | 24.8 | 24.6 | 24.7 | 24.9 | 24.9 | 24.8 |
| D.O. Initial | 8.4 | 8.3 | 8.3 | 8.3 | 8.3 | 8.4 | 8.4 |
| D.O. Final | 8.0 | 7.9 | 7.8 | 7.8 | 7.9 | 7.9 | 7.8 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 8.2 | 8.3 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 |
| Conductivity Init | | | | | | | |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 1.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.1 | 25.2 | 25.1 | 25.0 |
| Temp Final | 24.8 | 24.9 | 24.7 | 24.8 | 24.9 | 24.7 | 24.9 |
| D.O. Initial | 8.4 | 8.3 | 8.4 | 8.3 | 8.4 | 8.2 | 8.4 |
| D.O. Final | 8.3 | 8.4 | 8.3 | 8.2 | 8.3 | 8.3 | 8.2 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 8.4 | 8.4 | 8.3 | 8.4 | 8.4 | 8.4 | 8.3 |
| Conductivity Init | | | | | | | |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 7.5 ug/L | | | | | | | |
| Temp Init | 25.1 | 25.2 | 25.1 | 25.1 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.2 | 24.9 | 24.7 | 24.8 | 24.9 | 24.9 | 24.7 |
| D.O. Initial | 8.4 | 8.3 | 8.3 | 8.4 | 8.4 | 8.4 | 8.4 |
| D.O. Final | 7.8 | 7.7 | 7.6 | 7.7 | 7.8 | 7.7 | 7.6 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 8.1 | 8.2 | 8.1 | 8.2 | 8.2 | 8.2 | 8.2 |
| Conductivity Init | | 310 | 300 | 310 | 310 | 300 | 310 |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 2.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.1 | 25.2 | 25.1 | 25.0 |
| Temp Final | 24.8 | 24.9 | 24.7 | 24.8 | 24.9 | 24.6 | 24.9 |
| D.O. Initial | 8.4 | 8.3 | 8.4 | 8.3 | 8.3 | 8.2 | 8.3 |
| D.O. Final | 8.2 | 8.1 | 8.0 | 8.0 | 8.1 | 8.0 | 8.0 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 8.3 | 8.2 | 8.3 | 8.4 | 8.3 | 8.3 | 8.3 |
| Conductivity Init | | | | | | | |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 10.0 ug/L | | | | | | | |
| Temp Init | 25.1 | | | | | | |
| Temp Final | 25.2 | | | | | | |
| D.O. Initial | 8.4 | | | | | | |
| D.O. Final | 8.0 | | | | | | |
| pH Initial | 7.4 | | | | | | |
| pH Final | 8.0 | | | | | | |
| Conductivity Init | 310 | | | | | | |
| Conductivity Final | 320 | | | | | | |
| Alkalinity | | | | | | | |
| Hardness | | | | | | | |

ANALYST: Uva ANALYSIS DATES: 8/21-28/12

CaRP2

# *Pimephales promelas*

# REFERENCE TOXICANT TEST DATA

# CETIS Summary Report

Report Date: 14 Sep-12 11:12 (p 1 of 2)
Test Code: CS08-12CPp | 03-9175-7414

**Fathead Minnow 7-d Larval Survival and Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 06-8984-5117 | **Test Type:** | Growth-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 14:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 14:00 | **Species:** | Pimephales promelas | **Brine:** | |
| **Duration:** | 7d 0h | **Source:** | Aquatic Biosystems, CA | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 20-9197-3664 | **Code:** | 7CB0FC20 | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 14:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 14:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

## Comparison Summary

| Analysis ID | Endpoint | NOEL | LOEL | TOEL | PMSD | TU | Method |
|---|---|---|---|---|---|---|---|
| 08-7279-0963 | 7d Survival Rate | 30 | 40 | 34.64 | 15.2% | | Dunnett Multiple Comparison Test |
| 04-5114-9754 | Mean Dry Biomass-mg | 30 | >30 | NA | 22.2% | | Dunnett Multiple Comparison Test |

## Point Estimate Summary

| Analysis ID | Endpoint | Level | µg/L | 95% LCL | 95% UCL | TU | Method |
|---|---|---|---|---|---|---|---|
| 03-8416-9053 | 7d Survival Rate | EC50 | 38.25 | 36.14 | 40.48 | | Spearman-Kärber |
| 15-2363-5543 | Mean Dry Biomass-mg | IC5 | 30.51 | N/A | 31.02 | | Linear Interpolation (ICPIN) |
| | | IC10 | 31.35 | 8.689 | 31.85 | | |
| | | IC15 | 32.19 | 27.42 | 32.67 | | |
| | | IC20 | 33.03 | 29.68 | 33.51 | | |
| | | IC25 | 33.87 | 30.84 | 34.33 | | |
| | | IC40 | 36.4 | 34.41 | 36.82 | | |
| | | IC50 | 38.08 | 36.78 | 38.57 | | |

## Test Acceptability

| Analysis ID | Endpoint | Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|---|---|
| 03-8416-9053 | 7d Survival Rate | Control Resp | 0.95 | 0.8 - NL | Yes | Passes Acceptability Criteria |
| 08-7279-0963 | 7d Survival Rate | Control Resp | 0.95 | 0.8 - NL | Yes | Passes Acceptability Criteria |
| 04-5114-9754 | Mean Dry Biomass-mg | Control Resp | 0.3263 | 0.25 - NL | Yes | Passes Acceptability Criteria |
| 15-2363-5543 | Mean Dry Biomass-mg | Control Resp | 0.3263 | 0.25 - NL | Yes | Passes Acceptability Criteria |
| 04-5114-9754 | Mean Dry Biomass-mg | PMSD | 0.2219 | 0.08 - 0.22 | Yes | Above Acceptability Criteria |

## 7d Survival Rate Summary

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Min | Max | Std Err | Std Dev | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 0.95 | 0.9284 | 0.9716 | 0.9 | 1 | 0.02887 | 0.05774 | 6.08% | 0.0% |
| 10 | | 4 | 0.95 | 0.9127 | 0.9873 | 0.8 | 1 | 0.05 | 0.1 | 10.53% | 0.0% |
| 20 | | 4 | 0.9 | 0.8569 | 0.9431 | 0.8 | 1 | 0.05774 | 0.1155 | 12.83% | 5.26% |
| 30 | | 4 | 0.925 | 0.8892 | 0.9608 | 0.8 | 1 | 0.04787 | 0.09574 | 10.35% | 2.63% |
| 40 | | 4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0.0% | 47.37% |
| 50 | | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

## Mean Dry Biomass-mg Summary

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Min | Max | Std Err | Std Dev | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 0.3263 | 0.3165 | 0.336 | 0.3 | 0.353 | 0.01308 | 0.02616 | 8.02% | 0.0% |
| 10 | | 4 | 0.3465 | 0.3261 | 0.3669 | 0.266 | 0.383 | 0.02727 | 0.05454 | 15.74% | -6.21% |
| 20 | | 4 | 0.3248 | 0.3048 | 0.3447 | 0.277 | 0.373 | 0.02672 | 0.05344 | 16.46% | 0.46% |
| 30 | | 4 | 0.3347 | 0.3203 | 0.3492 | 0.285 | 0.371 | 0.01935 | 0.0387 | 11.56% | -2.61% |
| 40 | | 4 | 0.1297 | 0.1288 | 0.1307 | 0.127 | 0.133 | 0.00125 | 0.0025 | 1.93% | 60.23% |
| 50 | | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

Fathead Minnow 7-d Larval Survival and Growth Test — Aquatic Consulting & Testing, Inc.

**7d Survival Rate Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.9 | 1 | 0.9 | 1 |
| 10 | | 0.8 | 1 | 1 | 1 |
| 20 | | 0.8 | 0.8 | 1 | 1 |
| 30 | | 0.8 | 0.9 | 1 | 1 |
| 40 | | 0.5 | 0.5 | 0.5 | 0.5 |
| 50 | | 0 | 0 | 0 | 0 |

**Mean Dry Biomass-mg Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.3 | 0.344 | 0.308 | 0.353 |
| 10 | | 0.266 | 0.377 | 0.36 | 0.383 |
| 20 | | 0.28 | 0.277 | 0.369 | 0.373 |
| 30 | | 0.285 | 0.324 | 0.359 | 0.371 |
| 40 | | 0.129 | 0.13 | 0.127 | 0.133 |
| 50 | | 0 | 0 | 0 | 0 |

Fathead Minnow 7-d Larval Survival and Growth Test — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| Analysis ID: | 08-7279-0963 | Endpoint: | 7d Survival Rate | CETIS Version: | CETISv1.8.5 |
| Analyzed: | 14 Sep-12 11:10 | Analysis: | Parametric-Control vs Treatments | Official Results: | Yes |

## Angular (Corrected) Transformed Summary

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 1.331 | 1.181 | 1.48 | 1.331 | 1.249 | 1.412 | 0.04705 | 7.07% | 0.0% |
| 10 | | 4 | 1.336 | 1.093 | 1.578 | 1.412 | 1.107 | 1.412 | 0.07622 | 11.41% | -0.4% |
| 20 | | 4 | 1.26 | 0.9795 | 1.54 | 1.26 | 1.107 | 1.412 | 0.08801 | 13.97% | 5.33% |
| 30 | | 4 | 1.295 | 1.061 | 1.529 | 1.331 | 1.107 | 1.412 | 0.07348 | 11.35% | 2.67% |
| 40 | | 4 | 0.7854 | 0.7852 | 0.7856 | 0.7854 | 0.7854 | 0.7854 | 0 | 0.0% | 40.97% |
| 50 | | 4 | 0.1588 | 0.1588 | 0.1588 | 0.1588 | 0.1588 | 0.1588 | 0 | 0.0% | 88.07% |

## 7d Survival Rate Detail

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.9 | 1 | 0.9 | 1 |
| 10 | | 0.8 | 1 | 1 | 1 |
| 20 | | 0.8 | 0.8 | 1 | 1 |
| 30 | | 0.8 | 0.9 | 1 | 1 |
| 40 | | 0.5 | 0.5 | 0.5 | 0.5 |
| 50 | | 0 | 0 | 0 | 0 |

## Angular (Corrected) Transformed Detail

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 1.249 | 1.412 | 1.249 | 1.412 |
| 10 | | 1.107 | 1.412 | 1.412 | 1.412 |
| 20 | | 1.107 | 1.107 | 1.412 | 1.412 |
| 30 | | 1.107 | 1.249 | 1.412 | 1.412 |
| 40 | | 0.7854 | 0.7854 | 0.7854 | 0.7854 |
| 50 | | 0.1588 | 0.1588 | 0.1588 | 0.1588 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:12 (p 1 of 1)
Test Code: CS08-12CPp | 03-9175-7414

**Fathead Minnow 7-d Larval Survival and Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 03-8416-9053 | **Endpoint:** | 7d Survival Rate | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:10 | **Analysis:** | Untrimmed Spearman-Kärber | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 06-8984-5117 | **Test Type:** | Growth-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 14:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 14:00 | **Species:** | Pimephales promelas | **Brine:** | |
| **Duration:** | 7d 0h | **Source:** | Aquatic Biosystems, CA | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 20-9197-3664 | **Code:** | 7CB0FC20 | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 14:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 14:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

**Spearman-Kärber Estimates**

| Threshold Option | Threshold | Trim | Mu | Sigma | EC50 | 95% LCL | 95% UCL |
|---|---|---|---|---|---|---|---|
| Control Threshold | 0.05 | 0.00% | 1.583 | 0.01233 | 38.25 | 36.14 | 40.48 |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 0.95 | 0.8 - NL | Yes | Passes Acceptability Criteria |

**7d Survival Rate Summary**

| | | | Calculated Variate(A/B) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C-µg/L | Control Type | Count | Mean | Min | Max | Std Err | Std Dev | CV% | %Effect | A | B |
| 0 | Dilution Water | 4 | 0.95 | 0.9 | 1 | 0.02887 | 0.05773 | 6.08% | 0.0% | 38 | 40 |
| 10 | | 4 | 0.95 | 0.8 | 1 | 0.05 | 0.1 | 10.53% | 0.0% | 38 | 40 |
| 20 | | 4 | 0.9 | 0.8 | 1 | 0.05774 | 0.1155 | 12.83% | 5.26% | 36 | 40 |
| 30 | | 4 | 0.925 | 0.8 | 1 | 0.04787 | 0.09574 | 10.35% | 2.63% | 37 | 40 |
| 40 | | 4 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0.0% | 47.37% | 20 | 40 |
| 50 | | 4 | 0 | 0 | 0 | 0 | 0 | | 100.0% | 0 | 40 |

**7d Survival Rate Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.9 | 1 | 0.9 | 1 |
| 10 | | 0.8 | 1 | 1 | 1 |
| 20 | | 0.8 | 0.8 | 1 | 1 |
| 30 | | 0.8 | 0.9 | 1 | 1 |
| 40 | | 0.5 | 0.5 | 0.5 | 0.5 |
| 50 | | 0 | 0 | 0 | 0 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:12 (p 3 of 3)
Test Code: CS08-12CPp | 03-9175-7414

**Fathead Minnow 7-d Larval Survival and Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 04-5114-9754 | **Endpoint:** | Mean Dry Biomass-mg | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:11 | **Analysis:** | Parametric-Control vs Treatments | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 06-8984-5117 | **Test Type:** | Growth-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 14:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 14:00 | **Species:** | Pimephales promelas | **Brine:** | |
| **Duration:** | 7d 0h | **Source:** | Aquatic Biosystems, CA | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 20-9197-3664 | **Code:** | 7CB0FC20 | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 14:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 14:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

| Data Transform | Zeta | Alt Hyp | Trials | Seed | PMSD | NOEL | LOEL | TOEL | TU |
|---|---|---|---|---|---|---|---|---|---|
| Untransformed | NA | C > T | NA | NA | 22.2% | 30 | >30 | NA | |

**Dunnett Multiple Comparison Test**

| Control | vs | C-µg/L | Test Stat | Critical | MSD | DF | P-Value | P-Type | Decision(α:5%) |
|---|---|---|---|---|---|---|---|---|---|
| Dilution Water | | 10 | -0.6398 | 2.287 | 0.072 | 6 | 0.9163 | CDF | Non-Significant Effect |
| | | 20 | 0.0474 | 2.287 | 0.072 | 6 | 0.7328 | CDF | Non-Significant Effect |
| | | 30 | -0.2686 | 2.287 | 0.072 | 6 | 0.8351 | CDF | Non-Significant Effect |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 0.3263 | 0.25 - NL | Yes | Passes Acceptability Criteria |
| PMSD | 0.2219 | 0.08 - 0.22 | Yes | Above Acceptability Criteria |

**ANOVA Table**

| Source | Sum Squares | Mean Square | DF | F Stat | P-Value | Decision(α:5%) |
|---|---|---|---|---|---|---|
| Between | 0.001195686 | 0.0003985621 | 3 | 0.199 | 0.8951 | Non-Significant Effect |
| Error | 0.02403925 | 0.002003271 | 12 | | | |
| Total | 0.02523493 | | 15 | | | |

**Distributional Tests**

| Attribute | Test | Test Stat | Critical | P-Value | Decision(α:1%) |
|---|---|---|---|---|---|
| Variances | Bartlett Equality of Variance | 1.62 | 11.34 | 0.6549 | Equal Variances |
| Variances | Mod Levene Equality of Variance | 0.6401 | 5.953 | 0.6037 | Equal Variances |
| Variances | Levene Equality of Variance | 1.613 | 5.953 | 0.2382 | Equal Variances |
| Distribution | Shapiro-Wilk W Normality | 0.9095 | 0.8408 | 0.1142 | Normal Distribution |
| Distribution | Kolmogorov-Smirnov D | 0.1945 | 0.2471 | 0.1074 | Normal Distribution |
| Distribution | D'Agostino Skewness | 1.098 | 2.576 | 0.2723 | Normal Distribution |
| Distribution | Anderson-Darling A2 Normality | 0.683 | 3.878 | 0.0746 | Normal Distribution |

**Mean Dry Biomass-mg Summary**

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 0.3263 | 0.2846 | 0.3679 | 0.326 | 0.3 | 0.353 | 0.01308 | 8.02% | 0.0% |
| 10 | | 4 | 0.3465 | 0.2597 | 0.4333 | 0.3685 | 0.266 | 0.383 | 0.02727 | 15.74% | -6.21% |
| 20 | | 4 | 0.3248 | 0.2397 | 0.4098 | 0.3245 | 0.277 | 0.373 | 0.02672 | 16.46% | 0.46% |
| 30 | | 4 | 0.3347 | 0.2732 | 0.3963 | 0.3415 | 0.285 | 0.371 | 0.01935 | 11.56% | -2.61% |

**Mean Dry Biomass-mg Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.3 | 0.344 | 0.308 | 0.353 |
| 10 | | 0.266 | 0.377 | 0.36 | 0.383 |
| 20 | | 0.28 | 0.277 | 0.369 | 0.373 |
| 30 | | 0.285 | 0.324 | 0.359 | 0.371 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:12 (p 1 of 1)
Test Code: CS08-12CPp | 03-9175-7414

**Fathead Minnow 7-d Larval Survival and Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 15-2363-5543 | **Endpoint:** | Mean Dry Biomass-mg | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:11 | **Analysis:** | Linear Interpolation (ICPIN) | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 06-8984-5117 | **Test Type:** | Growth-Survival (7d) | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 14:00 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | Mod-Hard Synthetic Water |
| **Ending Date:** | 28 Aug-12 14:00 | **Species:** | Pimephales promelas | **Brine:** | |
| **Duration:** | 7d 0h | **Source:** | Aquatic Biosystems, CA | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 20-9197-3664 | **Code:** | 7CB0FC20 | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 14:00 | **Material:** | Copper sulfate | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 14:00 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

**Linear Interpolation Options**

| X Transform | Y Transform | Seed | Resamples | Exp 95% CL | Method |
|---|---|---|---|---|---|
| Linear | Linear | 0 | 280 | Yes | Two-Point Interpolation |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control Resp | 0.3263 | 0.25 - NL | Yes | Passes Acceptability Criteria |

**Point Estimates**

| Level | µg/L | 95% LCL | 95% UCL |
|---|---|---|---|
| IC5 | 30.51 | N/A | 31.02 |
| IC10 | 31.35 | 8.689 | 31.85 |
| IC15 | 32.19 | 27.42 | 32.67 |
| IC20 | 33.03 | 29.68 | 33.51 |
| IC25 | 33.87 | 30.84 | 34.33 |
| IC40 | 36.4 | 34.41 | 36.82 |
| IC50 | 38.08 | 36.78 | 38.57 |

**Mean Dry Biomass-mg Summary**

| | | | Calculated Variate | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C-µg/L | Control Type | Count | Mean | Min | Max | Std Err | Std Dev | CV% | %Effect |
| 0 | Dilution Water | 4 | 0.3263 | 0.3 | 0.353 | 0.01308 | 0.02616 | 8.02% | 0.0% |
| 10 | | 4 | 0.3465 | 0.266 | 0.383 | 0.02727 | 0.05454 | 15.74% | -6.21% |
| 20 | | 4 | 0.3248 | 0.277 | 0.373 | 0.02672 | 0.05344 | 16.46% | 0.46% |
| 30 | | 4 | 0.3347 | 0.285 | 0.371 | 0.01935 | 0.0387 | 11.56% | -2.61% |
| 40 | | 4 | 0.1297 | 0.127 | 0.133 | 0.00125 | 0.0025 | 1.93% | 60.23% |
| 50 | | 4 | 0 | 0 | 0 | 0 | 0 | | 100.0% |

**Mean Dry Biomass-mg Detail**

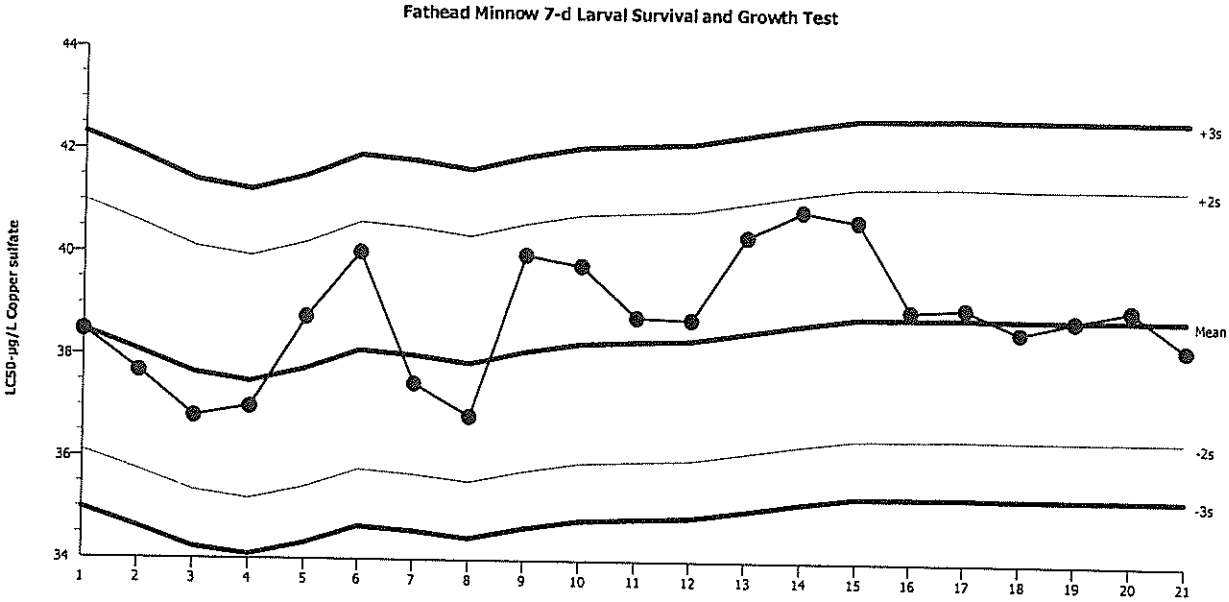
| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.3 | 0.344 | 0.308 | 0.353 |
| 10 | | 0.266 | 0.377 | 0.36 | 0.383 |
| 20 | | 0.28 | 0.277 | 0.369 | 0.373 |
| 30 | | 0.285 | 0.324 | 0.359 | 0.371 |
| 40 | | 0.129 | 0.13 | 0.127 | 0.133 |
| 50 | | 0 | 0 | 0 | 0 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:18 ( 1 of 1)

**Fathead Minnow 7-d Larval Survival and Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Growth-Survival (7d) | **Organism:** | Pimephales promelas (Fathead Minn | **Material:** | Copper sulfate |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | 7d Survival Rate | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 38.82 | **Count:** | 20 | **-2s Warning Limit:** | 36.42 | **-3s Action Limit:** | 35.28 |
| **Sigma:** | NA | **CV:** | 3.22% | **+2s Warning Limit:** | 41.35 | **+3s Action Limit:** | 42.68 |

**Quality Control Data**

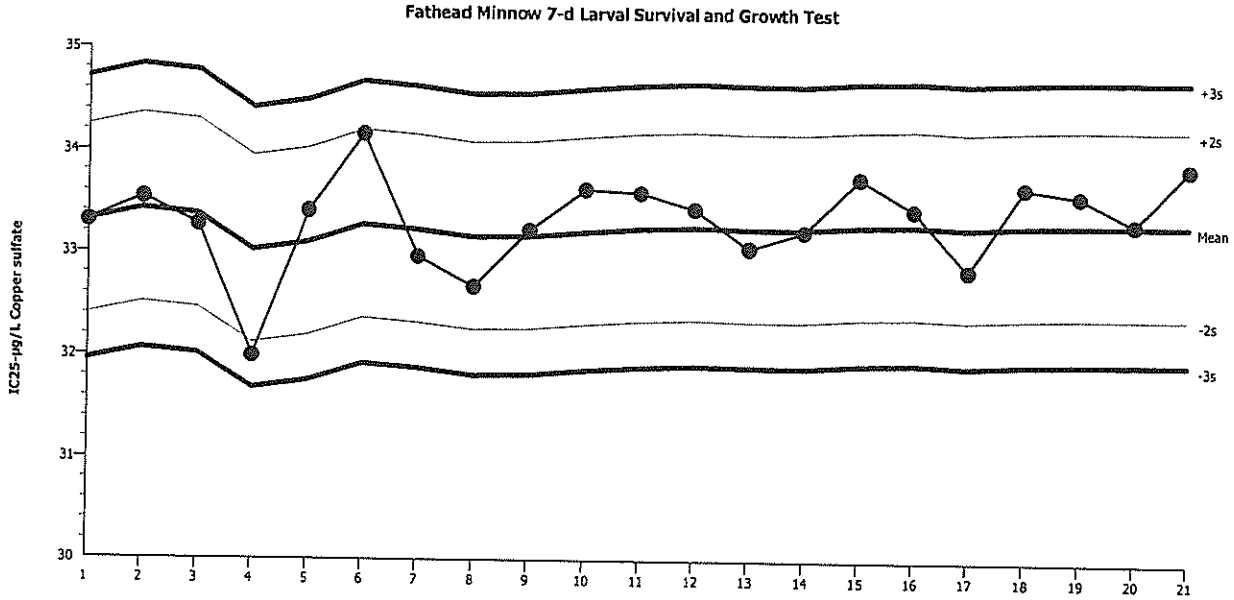
| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2010 | Dec | 7 | 12:15 | 38.48 | -0.3408 | -0.2778 | | | 08-3713-9288 | 00-5354-1860 |
| 2 | 2011 | Jan | 4 | 16:00 | 37.68 | -1.141 | -0.9394 | | | 05-6239-8042 | 18-0997-4276 |
| 3 | | Feb | 1 | 13:00 | 36.8 | -2.021 | -1.685 | | | 07-2098-0083 | 02-1432-3225 |
| 4 | | Mar | 8 | 15:30 | 36.99 | -1.833 | -1.523 | | | 13-4562-3281 | 10-3875-2717 |
| 5 | | Apr | 5 | 10:15 | 38.75 | -0.07432 | -0.06037 | | | 11-0611-5749 | 11-5872-7448 |
| 6 | | May10 | | 10:45 | 40.02 | 1.194 | 0.9542 | | | 06-9238-8892 | 13-7983-1613 |
| 7 | | Jun | 7 | 10:00 | 37.46 | -1.362 | -1.125 | | | 15-4946-5468 | 18-2118-2105 |
| 8 | | Jul | 12 | 9:45 | 36.82 | -2.005 | -1.671 | | | 07-8336-3828 | 16-5696-5870 |
| 9 | | Aug | 2 | 12:00 | 39.99 | 1.165 | 0.9315 | | | 10-9740-5691 | 15-4481-2398 |
| 10 | | Sep | 27 | 12:30 | 39.78 | 0.9602 | 0.7697 | | | 05-7348-3921 | 13-9864-9557 |
| 11 | | Oct | 4 | 12:30 | 38.78 | -0.04027 | -0.0327 | | | 05-4357-9255 | 17-0585-0140 |
| 12 | | Nov | 12 | 12:45 | 38.75 | -0.07432 | -0.06037 | | | 12-9888-6713 | 04-4587-5329 |
| 13 | | Dec | 6 | 11:45 | 40.37 | 1.551 | 1.234 | | | 15-8988-2326 | 15-4781-5352 |
| 14 | 2012 | Jan | 17 | 11:00 | 40.88 | 2.053 | 1.623 | | | 09-5560-4178 | 12-3728-7906 |
| 15 | | Feb | 21 | 13:00 | 40.69 | 1.866 | 1.479 | | | 17-6105-3401 | 00-3579-8655 |
| 16 | | Mar | 6 | 11:00 | 38.95 | 0.1233 | 0.09989 | | | 05-1953-0627 | 16-2858-6940 |
| 17 | | Apr | 3 | 13:00 | 39.01 | 0.1836 | 0.1486 | | | 16-4291-5280 | 16-1268-6218 |
| 18 | | May1 | | 10:00 | 38.54 | -0.2825 | -0.2301 | | | 01-6005-9141 | 12-5028-5253 |
| 19 | | Jun | 5 | 10:15 | 38.78 | -0.04027 | -0.0327 | | | 16-1051-7622 | 07-6110-9554 |
| 20 | | Jul | 10 | 13:30 | 39 | 0.1799 | 0.1457 | | | 01-6769-2349 | 16-8852-7138 |
| 21 | | Aug | 21 | 14:00 | 38.25 | -0.5741 | -0.4694 | | | 03-9175-7414 | 03-8416-9053 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:18 ( 1 of 1)

Fathead Minnow 7-d Larval Survival and Growth Test — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Growth-Survival (7d) | **Organism:** | Pimephales promelas (Fathead Minn | **Material:** | Copper sulfate |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Mean Dry Biomass-mg | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 33.31 | **Count:** | 20 | **-2s Warning Limit:** | 32.4 | **-3s Action Limit:** | 31.96 |
| **Sigma:** | NA | **CV:** | 1.39% | **+2s Warning Limit:** | 34.24 | **+3s Action Limit:** | 34.71 |

## Quality Control Data

| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2010 | Dec | 7 | 12:15 | 33.31 | -0.007852 | -0.01709 | | | 08-3713-9288 | 11-2688-1960 |
| 2 | 2011 | Jan | 4 | 16:00 | 33.53 | 0.2187 | 0.4744 | | | 05-6239-8042 | 04-0335-6336 |
| 3 | | Feb | 1 | 13:00 | 33.27 | -0.04572 | -0.09958 | | | 07-2098-0083 | 02-5239-4482 |
| 4 | | Mar | 8 | 15:30 | 32 | -1.316 | -2.924 | (-) | | 13-4562-3281 | 05-0936-8145 |
| 5 | | Apr | 5 | 10:15 | 33.41 | 0.09089 | 0.1976 | | | 11-0611-5749 | 18-0653-0812 |
| 6 | | May10 | | 10:45 | 34.16 | 0.8493 | 1.826 | | | 06-9238-8892 | 03-1678-8329 |
| 7 | | Jun | 7 | 10:00 | 32.97 | -0.3475 | -0.7604 | | | 15-4946-5468 | 09-6371-7830 |
| 8 | | Jul | 12 | 9:45 | 32.67 | -0.6411 | -1.409 | | | 07-8336-3828 | 05-2658-5599 |
| 9 | | Aug | 2 | 12:00 | 33.23 | -0.08434 | -0.1838 | | | 10-9740-5691 | 13-9702-8343 |
| 10 | | Sep | 27 | 12:30 | 33.63 | 0.3183 | 0.6896 | | | 05-7348-3921 | 15-3629-7352 |
| 11 | | Oct | 4 | 12:30 | 33.6 | 0.2891 | 0.6265 | | | 05-4357-9255 | 17-0311-3566 |
| 12 | | Nov | 12 | 12:45 | 33.45 | 0.1307 | 0.2838 | | | 12-9888-6713 | 09-1388-9575 |
| 13 | | Dec | 6 | 11:45 | 33.06 | -0.2518 | -0.5502 | | | 15-8988-2326 | 12-2856-6672 |
| 14 | 2012 | Jan | 17 | 11:00 | 33.23 | -0.08635 | -0.1882 | | | 09-5560-4178 | 10-4672-2162 |
| 15 | | Feb | 21 | 13:00 | 33.76 | 0.4406 | 0.9528 | | | 17-6105-3401 | 19-0987-3346 |
| 16 | | Mar | 6 | 11:00 | 33.44 | 0.1282 | 0.2785 | | | 05-1953-0627 | 03-9355-2833 |
| 17 | | Apr | 3 | 13:00 | 32.85 | -0.4617 | -1.012 | | | 16-4291-5280 | 09-1446-0648 |
| 18 | | May1 | | 10:00 | 33.67 | 0.3542 | 0.7668 | | | 01-6005-9141 | 16-9671-6596 |
| 19 | | Jun | 5 | 10:15 | 33.59 | 0.2765 | 0.5994 | | | 16-1051-7622 | 21-2373-0513 |
| 20 | | Jul | 10 | 13:30 | 33.32 | 0.009328 | 0.02029 | | | 01-6769-2349 | 19-1925-7224 |
| 21 | | Aug | 21 | 14:00 | 33.87 | 0.5587 | 1.206 | | | 03-9175-7414 | 15-2363-5543 |

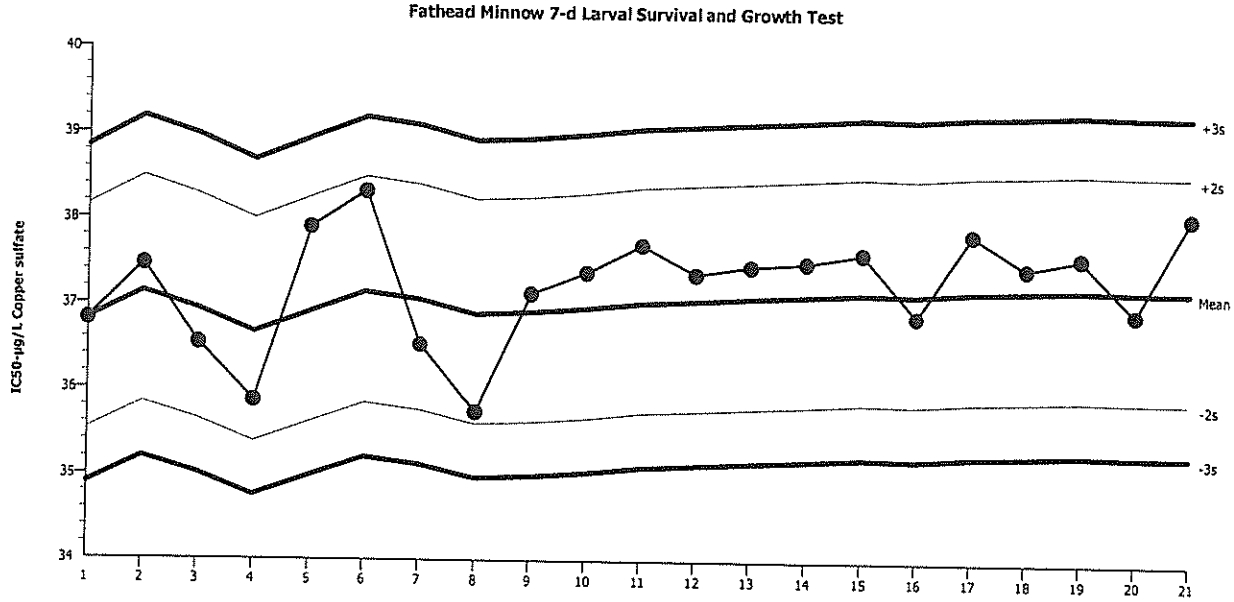
# CETIS QC Plot

Report Date: 14 Sep-12 11:18 ( 1 of 1)

Fathead Minnow 7-d Larval Survival and Growth Test

Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| Test Type: | Growth-Survival (7d) | Organism: | Pimephales promelas (Fathead Minn | Material: | Copper sulfate |
| Protocol: | EPA/821/R-02-013 (2002) | Endpoint: | Mean Dry Biomass-mg | Source: | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mean: | 37.19 | Count: | 20 | -2s Warning Limit: | 35.89 | -3s Action Limit: | 35.26 |
| Sigma: | NA | CV: | 1.80% | +2s Warning Limit: | 38.55 | +3s Action Limit: | 39.25 |

Quality Control Data

| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2010 | Dec | 7 | 12:15 | 36.82 | -0.3705 | -0.5603 | | | 08-3713-9288 | 11-2688-1960 |
| 2 | 2011 | Jan | 4 | 16:00 | 37.47 | 0.2785 | 0.4175 | | | 05-6239-8042 | 04-0335-6336 |
| 3 | | Feb | 1 | 13:00 | 36.54 | -0.6505 | -0.9875 | | | 07-2098-0083 | 02-5239-4482 |
| 4 | | Mar | 8 | 15:30 | 35.86 | -1.324 | -2.029 | (-) | | 13-4562-3281 | 05-0936-8145 |
| 5 | | Apr | 5 | 10:15 | 37.9 | 0.7155 | 1.066 | | | 11-0611-5749 | 18-0653-0812 |
| 6 | | May10 | | 10:45 | 38.33 | 1.14 | 1.689 | | | 06-9238-8892 | 03-1678-8329 |
| 7 | | Jun | 7 | 10:00 | 36.53 | -0.6603 | -1.002 | | | 15-4946-5468 | 09-6371-7830 |
| 8 | | Jul | 12 | 9:45 | 35.74 | -1.451 | -2.227 | (-) | | 07-8336-3828 | 05-2658-5599 |
| 9 | | Aug | 2 | 12:00 | 37.13 | -0.05471 | -0.08238 | | | 10-9740-5691 | 13-9702-8343 |
| 10 | | Sep | 27 | 12:30 | 37.39 | 0.1991 | 0.2988 | | | 05-7348-3921 | 15-3629-7352 |
| 11 | | Oct | 4 | 12:30 | 37.71 | 0.5243 | 0.7834 | | | 05-4357-9255 | 17-0311-3566 |
| 12 | | Nov | 12 | 12:45 | 37.37 | 0.185 | 0.2778 | | | 12-9888-6713 | 09-1388-9575 |
| 13 | | Dec | 6 | 11:45 | 37.47 | 0.279 | 0.4182 | | | 15-8988-2326 | 12-2856-6672 |
| 14 | 2012 | Jan | 17 | 11:00 | 37.51 | 0.3218 | 0.4821 | | | 09-5560-4178 | 10-4672-2162 |
| 15 | | Feb | 21 | 13:00 | 37.62 | 0.4326 | 0.6472 | | | 17-6105-3401 | 19-0987-3346 |
| 16 | | Mar | 6 | 11:00 | 36.89 | -0.3027 | -0.4573 | | | 05-1953-0627 | 03-9355-2833 |
| 17 | | Apr | 3 | 13:00 | 37.85 | 0.6656 | 0.9927 | | | 16-4291-5280 | 09-1446-0648 |
| 18 | | May1 | | 10:00 | 37.46 | 0.2694 | 0.404 | | | 01-6005-9141 | 16-9671-6596 |
| 19 | | Jun | 5 | 10:15 | 37.59 | 0.3995 | 0.598 | | | 16-1051-7622 | 21-2373-0513 |
| 20 | | Jul | 10 | 13:30 | 36.93 | -0.2539 | -0.3834 | | | 01-6769-2349 | 19-1925-7224 |
| 21 | | Aug | 21 | 14:00 | 38.08 | 0.8896 | 1.323 | | | 03-9175-7414 | 15-2363-5543 |

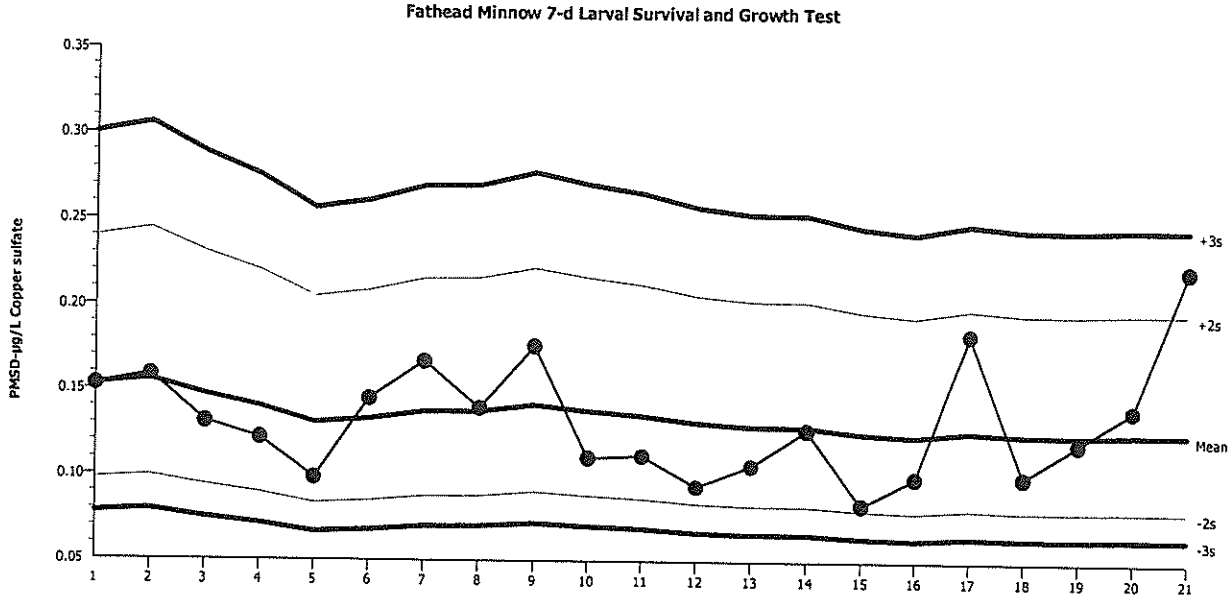
# CETIS QC Plot

Report Date: 14 Sep-12 11:19 ( 1 of 1)

Fathead Minnow 7-d Larval Survival and Growth Test

Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Growth-Survival (7d) | **Organism:** | Pimephales promelas (Fathead Minn | **Material:** | Copper sulfate |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Mean Dry Biomass-mg | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 0.1253 | **Count:** | 20 | **-2s Warning Limit:** | 0.07992 | **-3s Action Limit:** | 0.06384 |
| **Sigma:** | NA | **CV:** | 25.20% | **+2s Warning Limit:** | 0.1963 | **+3s Action Limit:** | 0.2458 |

## Quality Control Data

| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2010 | Dec | 7 | 12:15 | 0.153 | 0.02773 | 0.8898 | | | 08-3713-9288 | 05-2303-9011 |
| 2 | 2011 | Jan | 4 | 16:00 | 0.1588 | 0.03354 | 1.056 | | | 05-6239-8042 | 06-6760-7702 |
| 3 | | Feb | 1 | 13:00 | 0.1311 | 0.005815 | 0.2019 | | | 07-2098-0083 | 15-4669-1671 |
| 4 | | Mar | 8 | 15:30 | 0.1217 | -0.003564 | -0.1284 | | | 13-4562-3281 | 14-6632-9517 |
| 5 | | Apr | 5 | 10:15 | 0.09849 | -0.02681 | -1.071 | | | 11-0611-5749 | 05-7551-1827 |
| 6 | | May10 | | 10:45 | 0.1449 | 0.01962 | 0.6475 | | | 06-9238-8892 | 08-4733-0115 |
| 7 | | Jun | 7 | 10:00 | 0.1671 | 0.04176 | 1.28 | | | 15-4946-5468 | 19-5679-7181 |
| 8 | | Jul | 12 | 9:45 | 0.1395 | 0.01417 | 0.4766 | | | 07-8336-3828 | 10-4416-5064 |
| 9 | | Aug | 2 | 12:00 | 0.176 | 0.05074 | 1.513 | | | 10-9740-5691 | 01-2694-4275 |
| 10 | | Sep | 27 | 12:30 | 0.1105 | -0.01482 | -0.56 | | | 05-7348-3921 | 04-3030-1273 |
| 11 | | Oct | 4 | 12:30 | 0.1118 | -0.01348 | -0.5065 | | | 05-4357-9255 | 02-4443-8330 |
| 12 | | Nov | 12 | 12:45 | 0.09404 | -0.03127 | -1.278 | | | 12-9888-6713 | 05-7267-9652 |
| 13 | | Dec | 6 | 11:45 | 0.1063 | -0.01902 | -0.7327 | | | 15-8988-2326 | 07-6454-8462 |
| 14 | 2012 | Jan | 17 | 11:00 | 0.1272 | 0.001914 | 0.06746 | | | 09-5560-4178 | 16-3765-6045 |
| 15 | | Feb | 21 | 13:00 | 0.0833 | -0.04201 | -1.817 | | | 17-6105-3401 | 08-0880-7938 |
| 16 | | Mar | 6 | 11:00 | 0.09929 | -0.02602 | -1.036 | | | 05-1953-0627 | 06-9114-3449 |
| 17 | | Apr | 3 | 13:00 | 0.1837 | 0.05836 | 1.702 | | | 16-4291-5280 | 05-4700-8053 |
| 18 | | May1 | | 10:00 | 0.09981 | -0.0255 | -1.012 | | | 01-6005-9141 | 02-1222-4070 |
| 19 | | Jun | 5 | 10:15 | 0.1196 | -0.00566 | -0.2057 | | | 16-1051-7622 | 15-8521-3478 |
| 20 | | Jul | 10 | 13:30 | 0.1397 | 0.01442 | 0.4848 | | | 01-6769-2349 | 04-4621-6387 |
| 21 | | Aug | 21 | 14:00 | 0.2219 | 0.09659 | 2.543 | (+) | | 03-9175-7414 | 04-5114-9754 |

AQUATIC CONSULTING & TESTING, INC.
1525 West University Drive, #106
Tempe, AZ 85281

| | |
|---|---|
| CLIENT/PROJECT NAME | Reference Toxicant |
| SAMPLE I.D. | Copper sulfate |
| CLIENT I.D. | |

| | |
|---|---|
| TEST TYPE: | METHOD 1000.0 Survival and Growth |
| TEST START DATE/TIME | 8·21·12 @ 1400 |
| TEST END DATE/TIME | 8·28·12 @ 1400 |
| TEST ORGANISM | *Pimephales promelas* |
| AGE <24 hours | SOURCE Aquatic Biosystems, Inc. |

| | |
|---|---|
| SAMPLE TYPE: GRAB | COMPOSITE |
| DATE n/a | @ |
| DATE | @ |
| DATE | @ |

| | |
|---|---|
| DILUTION WATER TYPE: (synthetic) | receiving |
| DATE PREPARED: | |
| CHEMISTRY: | Alkalinity, mg/L |
| | Hardness, mg/l |
| | pH, SU |
| | Conductivity, umhos/cm |

| | | |
|---|---|---|
| SAMPLE CHEMISTRY | Alkalinity, mg/L n/a | |
| | Hardness, mg/l | |
| | NH3-N, mg/L | |
| | pH, SU | Cl2, mg/L |
| | Conductivity, umhos/cm | |

| ILLUMINATION | |
|---|---|
| HRS LIGHT | 16 |
| HRS DARK | 8 |
| uE | |

| ug/L DIL'N/ REP# | 0 hrs | 24 hrs | 48 hrs | 72 hrs | 96 hrs | 120 hrs | 144 hrs | 168 hrs | TARE mg | DRY + TARE, mg | DRY WT mg | PAN COUNT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ⊖ 1 | 10 | 10 | 9 | 9 | 9 | 9 | 9 | 9 | 33.13 | 36.13 | 3.00 | 9 |
| 2 | 10 | ↓ | 10 | 10 | 10 | 10 | 10 | 10 | 33.88 | 37.32 | 3.44 | 10 |
| 3 | 10 | ↓ | 9 | 9 | 9 | 9 | 9 | 9 | 33.90 | 36.98 | 3.08 | 9 |
| 4 | 10 | ↓ | 10 | 10 | 10 | 10 | 10 | 10 | 33.07 | 36.60 | 3.53 | 10 |
| 10.0 5 | 10 | 10 | 10 | 8 | 8 | 8 | 8 | 8 | 34.11 | 36.77 | 2.66 | 8 |
| 6 | 10 | ↓ | ↓ | 10 | 10 | 10 | 10 | 10 | 34.22 | 37.99 | 3.77 | 10 |
| 7 | 10 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 33.80 | 37.40 | 3.60 | 10 |
| 8 | 10 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 33.44 | 37.27 | 3.83 | 10 |
| 20.0 9 | 10 | 10 | 8 | 8 | 8 | 8 | 8 | 8 | 34.09 | 36.89 | 2.80 | 8 |
| 10 | 10 | ↓ | 8 | 8 | 8 | 8 | 8 | 8 | 33.99 | 36.76 | 2.77 | 8 |
| 11 | 10 | ↓ | 10 | 10 | 10 | 10 | 10 | 10 | 33.71 | 37.40 | 3.69 | 10 |
| 12 | 10 | ↓ | 10 | 10 | 10 | 10 | 10 | 10 | 33.16 | 36.89 | 3.73 | 10 |
| 30.0 13 | 10 | 10 | 8 | 8 | 8 | 8 | 8 | 8 | 34.03 | 36.88 | 2.85 | 8 |
| 14 | 10 | ↓ | 9 | 9 | 9 | 9 | 9 | 9 | 34.27 | 37.51 | 3.24 | 9 |
| 15 | 10 | ↓ | 10 | 10 | 10 | 10 | 10 | 10 | 33.21 | 36.80 | 3.59 | 10 |
| 16 | 10 | ↓ | 10 | 10 | 10 | 10 | 10 | 10 | 33.18 | 36.89 | 3.71 | 10 |
| 40.0 17 | 10 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 33.09 | 34.38 | 1.29 | 5 |
| 18 | 10 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 32.90 | 34.20 | 1.30 | 5 |
| 19 | 10 | 10 | 9 | 7 | 7 | 5 | 5 | 5 | 32.45 | 33.72 | 1.27 | 5 |
| 20 | 10 | 9 | 7 | 7 | 6 | 5 | 5 | 5 | 32.87 | 34.20 | 1.33 | 5 |
| 50.0 21 | 10 | ⊖ | | | | | | | | | | |
| 22 | 10 | ↓ | | | | | | | | | | |
| 23 | 10 | ↓ | | | | | | | | | | |
| 24 | 10 | ↓ | | | | | | | | | | |

| | |
|---|---|
| BALANCE CHECK, g | 1.91460 |
| DATE WEIGHED | 9·1·12 |
| HOURS DRIED | 6 |
| TEMP | 100°C |

ANALYSTS: Beth Atkinson

PpRTox 1

## DAILY CHEMICAL/PHYSICAL MEASUREMENTS

**PROJECT NAME:** Reference Toxicant **ORGANISM:** ✓ *Pimephales promelas* ____ *Ceriodaphnia dubia*

**SAMPLE I.D.:** ____ **TEST TYPE:** 1000.0

DAY

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 0.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.0 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.3 | 25.4 | 25.2 | 25.3 | 25.4 | 24.9 | 25.1 |
| D.O. Initial | 8.4 | 8.3 | 8.3 | 8.3 | 8.2 | 8.3 | 8.4 |
| D.O. Final | 8.2 | 8.2 | 8.1 | 8.4 | 8.1 | 8.2 | 8.0 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 7.8 | 7.7 | 7.8 | 7.8 | 7.9 | 7.9 | 7.8 |
| Conductivity Init | 300 | 300 | 310 | 300 | 300 | 300 | 310 |
| Conductivity Final | 310 | 310 | 320 | 310 | 320 | 310 | 320 |
| Alkalinity | 68 | 68 | 68 | 68 | 68 | 68 | 68 |
| Hardness | 92 | 92 | 92 | 92 | 92 | 92 | 92 |

DAY

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 30.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.0 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.8 | 24.9 | 25.7 | 25.9 | 25.8 | 25.6 | 25.5 |
| D.O. Initial | 8.4 | 8.3 | 8.3 | 8.3 | 8.2 | 8.3 | 8.4 |
| D.O. Final | 8.0 | 7.9 | 8.1 | 8.2 | 8.0 | 8.1 | 8.3 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 7.8 | 7.9 | 7.8 | 7.9 | 7.9 | 7.9 | 7.9 |
| Conductivity Init | | | | | | | |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 10.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.0 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.3 | 25.6 | 25.4 | 25.5 | 25.3 | 25.1 | 25.3 |
| D.O. Initial | 8.4 | 8.3 | 8.3 | 8.3 | 8.2 | 8.3 | 8.4 |
| D.O. Final | 8.2 | 8.1 | 8.1 | 8.2 | 8.1 | 8.2 | 8.1 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 7.8 | 7.9 | 7.8 | 7.8 | 7.7 | 7.8 | 7.8 |
| Conductivity Init | | | | | | | |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 40.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.0 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.5 | 25.4 | 25.5 | 24.8 | 25.4 | 25.5 | 25.3 |
| D.O. Initial | 8.3 | 8.4 | 8.3 | 8.4 | 8.3 | 8.4 | 8.3 |
| D.O. Final | 8.2 | 8.1 | 8.2 | 8.3 | 8.1 | 8.0 | 8.2 |
| pH Initial | 7.3 | 7.4 | 7.4 | 7.3 | 7.4 | 7.4 | 7.4 |
| pH Final | 7.9 | 7.8 | 7.9 | 7.8 | 7.9 | 7.9 | 7.8 |
| Conductivity Init | | 310 | 320 | 310 | 310 | 310 | 320 |
| Conductivity Final | | 320 | 330 | 320 | 320 | 320 | 330 |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 20.0 ug/L | | | | | | | |
| Temp Init | 24.9 | 25.2 | 25.1 | 25.0 | 25.2 | 25.1 | 25.0 |
| Temp Final | 25.6 | 24.9 | 25.5 | 25.7 | 25.5 | 25.0 | 25.4 |
| D.O. Initial | 8.4 | 8.3 | 8.3 | 8.3 | 8.2 | 8.3 | 8.4 |
| D.O. Final | 8.1 | 8.2 | 8.3 | 8.2 | 8.2 | 8.1 | 8.2 |
| pH Initial | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| pH Final | 7.8 | 7.9 | 7.8 | 7.9 | 7.8 | 7.8 | 7.9 |
| Conductivity Init | | | | | | | |
| Conductivity Final | | | | | | | |

| Vessel: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Conc: 50.0 ug/L | | | | | | | |
| Temp Init | 24.9 | | | | | | |
| Temp Final | 25.5 | | | | | | |
| D.O. Initial | 8.4 | | | | | | |
| D.O. Final | 8.1 | | | | | | |
| pH Initial | 7.3 | | | | | | |
| pH Final | 8.0 | | | | | | |
| Conductivity Init | 310 | | | | | | |
| Conductivity Final | 320 | | | | | | |
| Alkalinity | | | | | | | |
| Hardness | | | | | | | |

ANALYST: Lia ANALYSIS DATES: 8/21-28/12

Po RF-TOX 2

# *Pseudokirchneriella subcapitata*

# REFERENCE TOXICANT TEST DATA

# CETIS Summary Report

Report Date: 14 Sep-12 11:13 (p 1 of 1)
Test Code: CC08-12CRs | 03-2188-4750

**Selenastrum Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| Batch ID: | 08-7006-8216 | Test Type: | Cell Growth | Analyst: | Elizabeth Atkinson |
| Start Date: | 21 Aug-12 16:15 | Protocol: | EPA/821/R-02-013 (2002) | Diluent: | |
| Ending Date: | 25 Aug-12 16:30 | Species: | Pseudokirchneriella subcapitata | Brine: | |
| Duration: | 4d 0h | Source: | In-House Culture | Age: | |

| | | | | | |
|---|---|---|---|---|---|
| Sample ID: | 07-7099-8764 | Code: | 2DF481EC | Client: | Aquatic Consulting & Testing, Inc. |
| Sample Date: | 21 Aug-12 16:15 | Material: | Cadmium chloride | Project: | Reference Toxicant |
| Receive Date: | 21 Aug-12 16:15 | Source: | Reference Toxicant | | |
| Sample Age: | NA | Station: | | | |

## Comparison Summary

| Analysis ID | Endpoint | NOEL | LOEL | TOEL | PMSD | TU | Method |
|---|---|---|---|---|---|---|---|
| 04-0035-9708 | Light Absorbance | 40 | 60 | 48.99 | 5.18% | | Dunnett Multiple Comparison Test |

## Point Estimate Summary

| Analysis ID | Endpoint | Level | µg/L | 95% LCL | 95% UCL | TU | Method |
|---|---|---|---|---|---|---|---|
| 07-5594-2853 | Light Absorbance | IC5 | 45.33 | 44.33 | 46.26 | | Linear Interpolation (ICPIN) |
| | | IC10 | 50.66 | 48.89 | 52.53 | | |
| | | IC15 | 55.99 | 53.34 | 58.79 | | |
| | | IC20 | 61.01 | 57.96 | 63.38 | | |
| | | IC25 | 65.13 | 62.35 | 67.97 | | |
| | | IC40 | 77.47 | 73.35 | 83.22 | | |
| | | IC50 | 85.6 | 81.1 | 89.18 | | |

## Test Acceptability

| Analysis ID | Endpoint | Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|---|---|
| 04-0035-9708 | Light Absorbance | Control CV | 0.01815 | NL - 0.2 | Yes | Passes Acceptability Criteria |
| 07-5594-2853 | Light Absorbance | Control CV | 0.01815 | NL - 0.2 | Yes | Passes Acceptability Criteria |
| 04-0035-9708 | Light Absorbance | PMSD | 0.05179 | 0.091 - 0.29 | Yes | Below Acceptability Criteria |

## Light Absorbance Summary

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Min | Max | Std Err | Std Dev | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 0.119 | 0.1182 | 0.1198 | 0.116 | 0.121 | 0.00108 | 0.00216 | 1.82% | 0.0% |
| 20 | | 4 | 0.1203 | 0.1194 | 0.1211 | 0.118 | 0.123 | 0.001109 | 0.002217 | 1.84% | -1.05% |
| 40 | | 4 | 0.1217 | 0.1209 | 0.1226 | 0.12 | 0.125 | 0.001181 | 0.002363 | 1.94% | -2.31% |
| 60 | | 4 | 0.09775 | 0.09655 | 0.09895 | 0.093 | 0.1 | 0.001601 | 0.003202 | 3.28% | 17.86% |
| 80 | | 4 | 0.0685 | 0.06596 | 0.07104 | 0.059 | 0.075 | 0.003403 | 0.006807 | 9.94% | 42.44% |
| 100 | | 4 | 0.03875 | 0.03777 | 0.03973 | 0.035 | 0.041 | 0.001315 | 0.00263 | 6.79% | 67.44% |

## Light Absorbance Detail

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.119 | 0.121 | 0.12 | 0.116 |
| 20 | | 0.123 | 0.118 | 0.119 | 0.121 |
| 40 | | 0.122 | 0.12 | 0.125 | 0.12 |
| 60 | | 0.099 | 0.093 | 0.1 | 0.099 |
| 80 | | 0.075 | 0.059 | 0.069 | 0.071 |
| 100 | | 0.041 | 0.035 | 0.04 | 0.039 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:13 (p 1 of 2)
Test Code: CC08-12CRs | 03-2188-4750

**Selenastrum Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 04-0035-9708 | **Endpoint:** | Light Absorbance | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:08 | **Analysis:** | Parametric-Control vs Treatments | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 08-7006-8216 | **Test Type:** | Cell Growth | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 16:15 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | |
| **Ending Date:** | 25 Aug-12 16:30 | **Species:** | Pseudokirchneriella subcapitata | **Brine:** | |
| **Duration:** | 4d 0h | **Source:** | In-House Culture | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 07-7099-8764 | **Code:** | 2DF481EC | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 16:15 | **Material:** | Cadmium chloride | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 16:15 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

| Data Transform | Zeta | Alt Hyp | Trials | Seed | PMSD | NOEL | LOEL | TOEL | TU |
|---|---|---|---|---|---|---|---|---|---|
| Untransformed | NA | C > T | NA | NA | 5.18% | 40 | 60 | 48.99 | |

**Dunnett Multiple Comparison Test**

| Control | vs | C-µg/L | Test Stat | Critical | MSD | DF | P-Value | P-Type | Decision(α:5%) |
|---|---|---|---|---|---|---|---|---|---|
| Dilution Water | | 20 | -0.4882 | 2.407 | 0.006 | 6 | 0.9380 | CDF | Non-Significant Effect |
| | | 40 | -1.074 | 2.407 | 0.006 | 6 | 0.9859 | CDF | Non-Significant Effect |
| | | 60* | 8.3 | 2.407 | 0.006 | 6 | <0.0001 | CDF | Significant Effect |
| | | 80* | 19.72 | 2.407 | 0.006 | 6 | <0.0001 | CDF | Significant Effect |
| | | 100* | 31.34 | 2.407 | 0.006 | 6 | <0.0001 | CDF | Significant Effect |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control CV | 0.01815 | NL - 0.2 | Yes | Passes Acceptability Criteria |
| PMSD | 0.05179 | 0.091 - 0.29 | Yes | Below Acceptability Criteria |

**ANOVA Table**

| Source | Sum Squares | Mean Square | DF | F Stat | P-Value | Decision(α:5%) |
|---|---|---|---|---|---|---|
| Between | 0.02320133 | 0.004640267 | 5 | 353.9 | <0.0001 | Significant Effect |
| Error | 0.0002360001 | 1.311111E-05 | 18 | | | |
| Total | 0.02343733 | | 23 | | | |

**Distributional Tests**

| Attribute | Test | Test Stat | Critical | P-Value | Decision(α:1%) |
|---|---|---|---|---|---|
| Variances | Bartlett Equality of Variance | 6.615 | 15.09 | 0.2509 | Equal Variances |
| Variances | Mod Levene Equality of Variance | 0.8034 | 4.248 | 0.5619 | Equal Variances |
| Variances | Levene Equality of Variance | 1.414 | 4.248 | 0.2664 | Equal Variances |
| Distribution | Shapiro-Wilk W Normality | 0.9294 | 0.884 | 0.0946 | Normal Distribution |
| Distribution | Kolmogorov-Smirnov D | 0.1667 | 0.2056 | 0.0833 | Normal Distribution |
| Distribution | D'Agostino Skewness | 2.048 | 2.576 | 0.0405 | Normal Distribution |
| Distribution | D'Agostino Kurtosis | 2.051 | 2.576 | 0.0403 | Normal Distribution |
| Distribution | D'Agostino-Pearson K2 Omnibus | 8.4 | 9.21 | 0.0150 | Normal Distribution |
| Distribution | Anderson-Darling A2 Normality | 0.7091 | 3.878 | 0.0641 | Normal Distribution |

**Light Absorbance Summary**

| C-µg/L | Control Type | Count | Mean | 95% LCL | 95% UCL | Median | Min | Max | Std Err | CV% | %Effect |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Dilution Water | 4 | 0.119 | 0.1156 | 0.1224 | 0.1195 | 0.116 | 0.121 | 0.00108 | 1.82% | 0.0% |
| 20 | | 4 | 0.1203 | 0.1167 | 0.1238 | 0.12 | 0.118 | 0.123 | 0.001109 | 1.84% | -1.05% |
| 40 | | 4 | 0.1217 | 0.118 | 0.1255 | 0.121 | 0.12 | 0.125 | 0.001181 | 1.94% | -2.31% |
| 60 | | 4 | 0.09775 | 0.09266 | 0.1028 | 0.099 | 0.093 | 0.1 | 0.001601 | 3.28% | 17.86% |
| 80 | | 4 | 0.0685 | 0.05767 | 0.07933 | 0.07 | 0.059 | 0.075 | 0.003403 | 9.94% | 42.44% |
| 100 | | 4 | 0.03875 | 0.03457 | 0.04293 | 0.0395 | 0.035 | 0.041 | 0.001315 | 6.79% | 67.44% |

**Selenastrum Growth Test** — **Aquatic Consulting & Testing, Inc.**

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 04-0035-9708 | **Endpoint:** | Light Absorbance | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:08 | **Analysis:** | Parametric-Control vs Treatments | **Official Results:** | Yes |

**Light Absorbance Detail**

| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.119 | 0.121 | 0.12 | 0.116 |
| 20 | | 0.123 | 0.118 | 0.119 | 0.121 |
| 40 | | 0.122 | 0.12 | 0.125 | 0.12 |
| 60 | | 0.099 | 0.093 | 0.1 | 0.099 |
| 80 | | 0.075 | 0.059 | 0.069 | 0.071 |
| 100 | | 0.041 | 0.035 | 0.04 | 0.039 |

# CETIS Analytical Report

Report Date: 14 Sep-12 11:13 (p 1 of 1)
Test Code: CC08-12CRs | 03-2188-4750

**Selenastrum Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Analysis ID:** | 07-5594-2853 | **Endpoint:** | Light Absorbance | **CETIS Version:** | CETISv1.8.5 |
| **Analyzed:** | 14 Sep-12 11:08 | **Analysis:** | Linear Interpolation (ICPIN) | **Official Results:** | Yes |

| | | | | | |
|---|---|---|---|---|---|
| **Batch ID:** | 08-7006-8216 | **Test Type:** | Cell Growth | **Analyst:** | Elizabeth Atkinson |
| **Start Date:** | 21 Aug-12 16:15 | **Protocol:** | EPA/821/R-02-013 (2002) | **Diluent:** | |
| **Ending Date:** | 25 Aug-12 16:30 | **Species:** | Pseudokirchneriella subcapitata | **Brine:** | |
| **Duration:** | 4d 0h | **Source:** | In-House Culture | **Age:** | |

| | | | | | |
|---|---|---|---|---|---|
| **Sample ID:** | 07-7099-8764 | **Code:** | 2DF481EC | **Client:** | Aquatic Consulting & Testing, Inc. |
| **Sample Date:** | 21 Aug-12 16:15 | **Material:** | Cadmium chloride | **Project:** | Reference Toxicant |
| **Receive Date:** | 21 Aug-12 16:15 | **Source:** | Reference Toxicant | | |
| **Sample Age:** | NA | **Station:** | | | |

**Linear Interpolation Options**

| X Transform | Y Transform | Seed | Resamples | Exp 95% CL | Method |
|---|---|---|---|---|---|
| Linear | Linear | 0 | 280 | Yes | Two-Point Interpolation |

**Test Acceptability Criteria**

| Attribute | Test Stat | TAC Limits | Overlap | Decision |
|---|---|---|---|---|
| Control CV | 0.01815 | NL - 0.2 | Yes | Passes Acceptability Criteria |

**Point Estimates**

| Level | µg/L | 95% LCL | 95% UCL |
|---|---|---|---|
| IC5 | 45.33 | 44.33 | 46.26 |
| IC10 | 50.66 | 48.89 | 52.53 |
| IC15 | 55.99 | 53.34 | 58.79 |
| IC20 | 61.01 | 57.96 | 63.38 |
| IC25 | 65.13 | 62.35 | 67.97 |
| IC40 | 77.47 | 73.35 | 83.22 |
| IC50 | 85.6 | 81.1 | 89.18 |

**Light Absorbance Summary**

| | | | Calculated Variate | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C-µg/L | Control Type | Count | Mean | Min | Max | Std Err | Std Dev | CV% | %Effect |
| 0 | Dilution Water | 4 | 0.119 | 0.116 | 0.121 | 0.00108 | 0.00216 | 1.82% | 0.0% |
| 20 | | 4 | 0.1203 | 0.118 | 0.123 | 0.001109 | 0.002217 | 1.84% | -1.05% |
| 40 | | 4 | 0.1217 | 0.12 | 0.125 | 0.001181 | 0.002363 | 1.94% | -2.31% |
| 60 | | 4 | 0.09775 | 0.093 | 0.1 | 0.001601 | 0.003202 | 3.28% | 17.86% |
| 80 | | 4 | 0.0685 | 0.059 | 0.075 | 0.003403 | 0.006807 | 9.94% | 42.44% |
| 100 | | 4 | 0.03875 | 0.035 | 0.041 | 0.001315 | 0.00263 | 6.79% | 67.44% |

**Light Absorbance Detail**

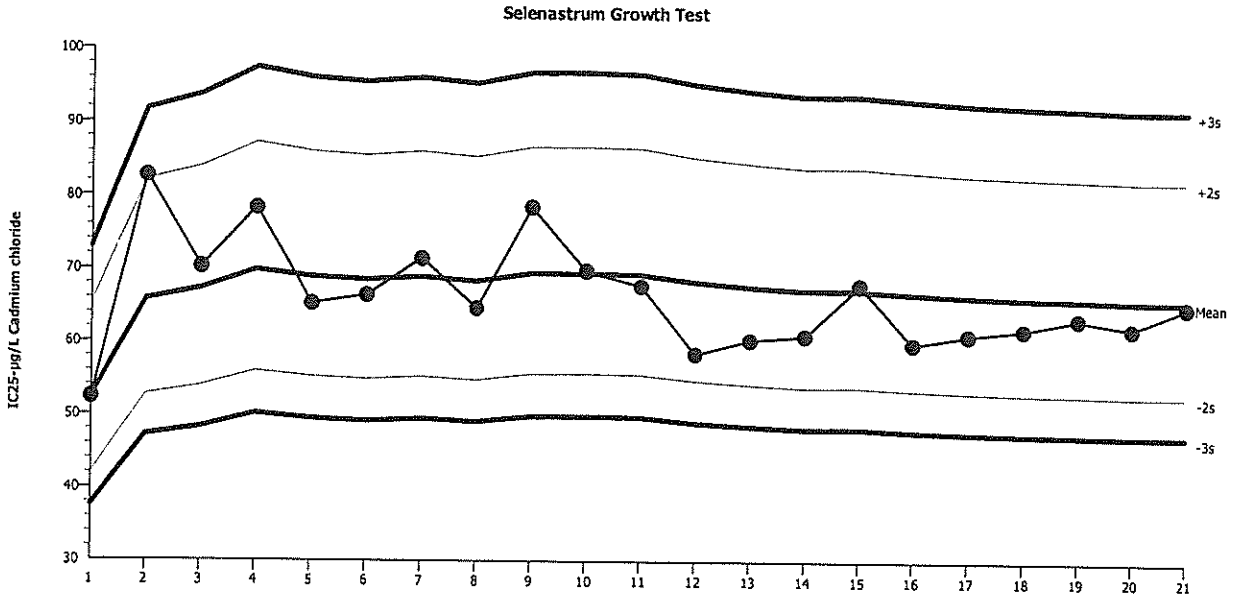
| C-µg/L | Control Type | Rep 1 | Rep 2 | Rep 3 | Rep 4 |
|---|---|---|---|---|---|
| 0 | Dilution Water | 0.119 | 0.121 | 0.12 | 0.116 |
| 20 | | 0.123 | 0.118 | 0.119 | 0.121 |
| 40 | | 0.122 | 0.12 | 0.125 | 0.12 |
| 60 | | 0.099 | 0.093 | 0.1 | 0.099 |
| 80 | | 0.075 | 0.059 | 0.069 | 0.071 |
| 100 | | 0.041 | 0.035 | 0.04 | 0.039 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:18 ( 1 of 1)

**Selenastrum Growth Test** — Aquatic Consulting & Testing, Inc.

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Cell Growth | **Organism:** | Pseudokirchneriella subcapitata (Gre | **Material:** | Cadmium chloride |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Light Absorbance | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 65.83 | **Count:** | 20 | **-2s Warning Limit:** | 52.73 | **-3s Action Limit:** | 47.21 |
| **Sigma:** | NA | **CV:** | 11.70% | **+2s Warning Limit:** | 82.11 | **+3s Action Limit:** | 91.72 |

**Quality Control Data**

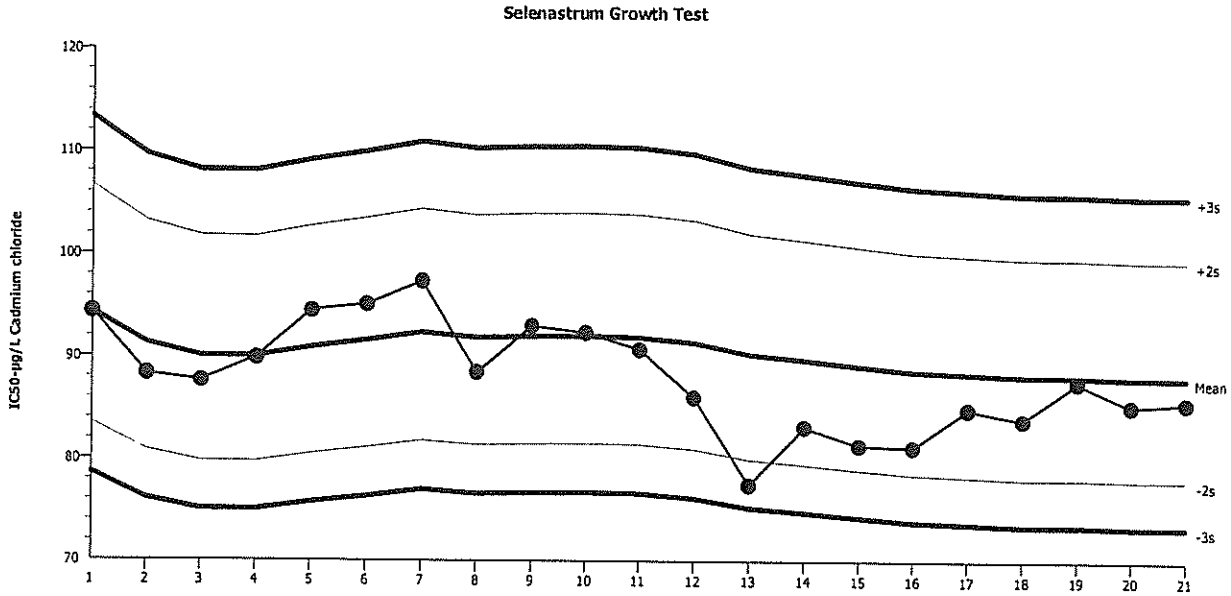
| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | Mar | 8 | 16:30 | 52.35 | -13.47 | -2.069 | (-) | | 11-1611-8210 | 13-5742-4077 |
| 2 | | | 16 | 14:00 | 82.68 | 16.86 | 2.06 | (+) | | 11-5427-2533 | 06-4830-8056 |
| 3 | | | 22 | 9:00 | 70.26 | 4.438 | 0.5894 | | | 17-0580-0281 | 03-1271-3884 |
| 4 | | Apr | 4 | 14:45 | 78.33 | 12.51 | 1.572 | | | 17-3697-5722 | 13-5570-0436 |
| 5 | | May10 | | 8:00 | 65.27 | -0.5583 | -0.07695 | | | 19-5457-6276 | 08-0211-1260 |
| 6 | | Jun | 7 | 17:45 | 66.44 | 0.6157 | 0.0841 | | | 08-4187-8917 | 07-3355-3226 |
| 7 | | Jul | 12 | 17:00 | 71.48 | 5.656 | 0.7447 | | | 05-6532-1400 | 14-8818-2612 |
| 8 | | Aug | 2 | 13:00 | 64.64 | -1.182 | -0.1637 | | | 12-4977-7801 | 17-6410-1487 |
| 9 | | Sep | 27 | 13:30 | 78.48 | 12.66 | 1.589 | | | 10-5247-8130 | 14-5910-5464 |
| 10 | | Oct | 4 | 15:30 | 69.8 | 3.975 | 0.5297 | | | 04-6512-6656 | 15-5568-9092 |
| 11 | | Nov | 11 | 8:00 | 67.79 | 1.967 | 0.266 | | | 07-2211-6064 | 11-7124-2404 |
| 12 | | Dec | 6 | 18:30 | 58.47 | -7.357 | -1.071 | | | 15-0050-8702 | 00-7184-4353 |
| 13 | 2012 | Jan | 17 | 6:30 | 60.4 | -5.425 | -0.777 | | | 16-8568-5103 | 13-8518-2061 |
| 14 | | | 31 | 6:30 | 61.01 | -4.813 | -0.6858 | | | 10-8162-6674 | 09-3742-2419 |
| 15 | | Feb | 21 | 15:00 | 67.94 | 2.113 | 0.2854 | | | 04-4655-6545 | 04-1514-2414 |
| 16 | | Mar | 5 | 15:30 | 59.86 | -5.968 | -0.8586 | | | 04-3538-5949 | 12-6498-6764 |
| 17 | | Apr | 3 | 15:00 | 61.1 | -4.72 | -0.6722 | | | 08-7328-7176 | 15-1754-9131 |
| 18 | | May1 | | 16:30 | 61.91 | -3.918 | -0.5544 | | | 08-3609-2102 | 05-8032-2908 |
| 19 | | Jun | 5 | 8:00 | 63.41 | -2.416 | -0.3378 | | | 07-6241-2351 | 09-4186-2002 |
| 20 | | Jul | 9 | 17:15 | 62.11 | -3.717 | -0.5251 | | | 16-8982-3937 | 19-0729-3731 |
| 21 | | Aug | 21 | 16:15 | 65.13 | -0.6968 | -0.09614 | | | 03-2188-4750 | 07-5594-2853 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:17 ( 1 of 1)

**Selenastrum Growth Test** — **Aquatic Consulting & Testing, Inc.**

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Cell Growth | **Organism:** | Pseudokirchneriella subcapitata (Gre | **Material:** | Cadmium chloride |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Light Absorbance | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 87.97 | **Count:** | 20 | **-2s Warning Limit:** | 77.89 | **-3s Action Limit:** | 73.29 |
| **Sigma:** | NA | **CV:** | 6.28% | **+2s Warning Limit:** | 99.39 | **+3s Action Limit:** | 105.6 |

**Quality Control Data**

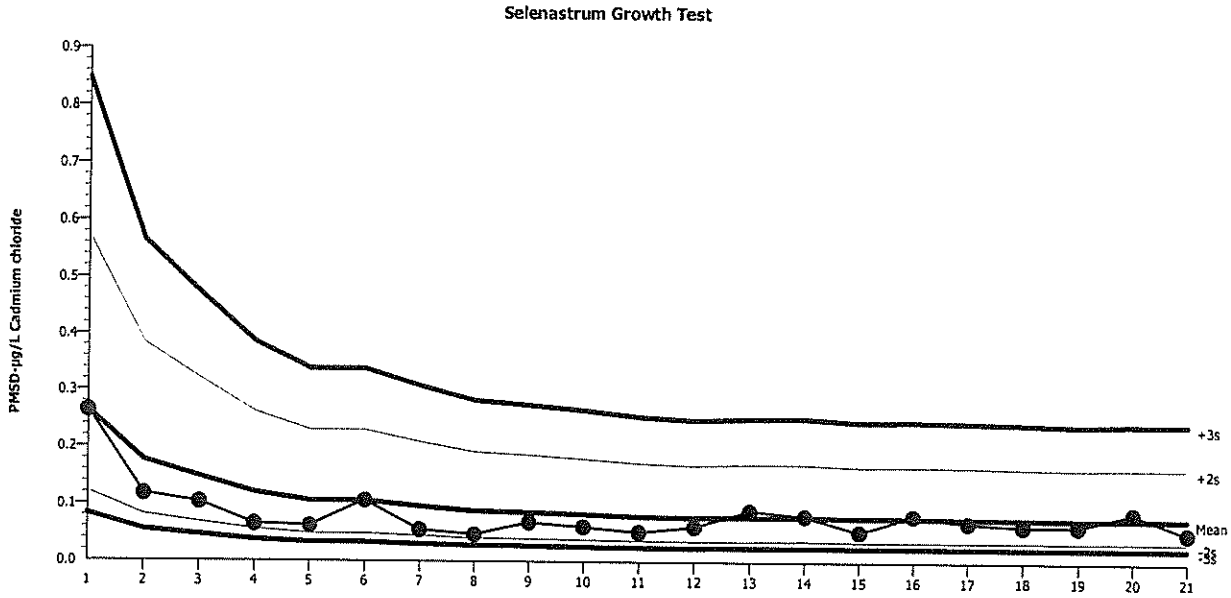
| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2010 | Jul | 12 | 17:45 | 94.4 | 6.432 | 1.158 | | | 10-5434-2072 | 08-0572-7292 |
| 2 | | Oct | 4 | 14:00 | 88.31 | 0.3421 | 0.06371 | | | 08-0240-6732 | 02-8071-2402 |
| 3 | | Dec | 6 | 14:00 | 87.65 | -0.3233 | -0.06043 | | | 04-7016-7402 | 14-2020-8860 |
| 4 | 2011 | Mar | 8 | 16:30 | 89.88 | 1.913 | 0.3531 | | | 11-1611-8210 | 13-5742-4077 |
| 5 | | | 22 | 9:00 | 94.53 | 6.556 | 1.18 | | | 17-0580-0281 | 03-1271-3884 |
| 6 | | May10 | | 8:00 | 95.13 | 7.158 | 1.284 | | | 19-5457-6276 | 08-0211-1260 |
| 7 | | Jun | 7 | 17:45 | 97.37 | 9.403 | 1.667 | | | 08-4187-8917 | 07-3355-3226 |
| 8 | | Aug | 2 | 13:00 | 88.48 | 0.5127 | 0.09537 | | | 12-4977-7801 | 17-6410-1487 |
| 9 | | Sep | 27 | 13:30 | 93.04 | 5.068 | 0.9193 | | | 10-5247-8130 | 14-5910-5464 |
| 10 | | Oct | 4 | 15:30 | 92.39 | 4.419 | 0.8043 | | | 04-6512-6656 | 15-5568-9092 |
| 11 | | Nov | 11 | 8:00 | 90.78 | 2.81 | 0.516 | | | 07-2211-6064 | 11-7124-2404 |
| 12 | | Dec | 6 | 18:30 | 86.08 | -1.892 | -0.3568 | | | 15-0050-8702 | 00-7184-4353 |
| 13 | 2012 | Jan | 17 | 6:30 | 77.47 | -10.5 | -2.087 | (-) | | 16-8568-5103 | 13-8518-2061 |
| 14 | | | 31 | 6:30 | 83.17 | -4.802 | -0.9214 | | | 10-8162-6674 | 09-3742-2419 |
| 15 | | Feb | 21 | 15:00 | 81.37 | -6.605 | -1.281 | | | 04-4655-6545 | 04-1514-2414 |
| 16 | | Mar | 5 | 15:30 | 81.17 | -6.796 | -1.32 | | | 04-3538-5949 | 12-6498-6764 |
| 17 | | Apr | 3 | 15:00 | 84.9 | -3.071 | -0.5831 | | | 08-7328-7176 | 15-1754-9131 |
| 18 | | May1 | | 16:30 | 83.86 | -4.112 | -0.7857 | | | 08-3609-2102 | 05-8032-2908 |
| 19 | | Jun | 5 | 8:00 | 87.57 | -0.3979 | -0.0744 | | | 07-6241-2351 | 09-4186-2002 |
| 20 | | Jul | 9 | 17:15 | 85.26 | -2.709 | -0.5133 | | | 16-8982-3937 | 19-0729-3731 |
| 21 | | Aug | 21 | 16:15 | 85.6 | -2.368 | -0.4479 | | | 03-2188-4750 | 07-5594-2853 |

# CETIS QC Plot

Report Date: 14 Sep-12 11:18 ( 1 of 1)

**Selenastrum Growth Test** — **Aquatic Consulting & Testing, Inc.**

| | | | | | |
|---|---|---|---|---|---|
| **Test Type:** | Cell Growth | **Organism:** | Pseudokirchneriella subcapitata (Gre | **Material:** | Cadmium chloride |
| **Protocol:** | EPA/821/R-02-013 (2002) | **Endpoint:** | Light Absorbance | **Source:** | Reference Toxicant-REF |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mean:** | 0.07562 | **Count:** | 20 | **-2s Warning Limit:** | 0.03481 | **-3s Action Limit:** | 0.02362 |
| **Sigma:** | NA | **CV:** | 47.40% | **+2s Warning Limit:** | 0.1643 | **+3s Action Limit:** | 0.2421 |

**Quality Control Data**

| Point | Year | Month | Day | Time | QC Data | Delta | Sigma | Warning | Action | Test ID | Analysis ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2011 | Mar | 8 | 16:30 | 0.2647 | 0.189 | 3.229 | (+) | (+) | 11-1611-8210 | 01-3774-5111 |
| 2 | | | 16 | 14:00 | 0.1178 | 0.04217 | 1.142 | | | 11-5427-2533 | 19-4608-3560 |
| 3 | | | 22 | 9:00 | 0.1037 | 0.0281 | 0.8145 | | | 17-0580-0281 | 12-8855-3794 |
| 4 | | Apr | 4 | 14:45 | 0.06509 | -0.01053 | -0.3866 | | | 17-3697-5722 | 09-7654-0592 |
| 5 | | May10 | | 8:00 | 0.06232 | -0.01331 | -0.499 | | | 19-5457-6276 | 14-4335-7154 |
| 6 | | Jun | 7 | 17:45 | 0.1064 | 0.03076 | 0.8798 | | | 08-4187-8917 | 03-0774-2510 |
| 7 | | Jul | 12 | 17:00 | 0.05522 | -0.02041 | -0.8107 | | | 05-6532-1400 | 00-2259-7419 |
| 8 | | Aug | 2 | 13:00 | 0.04732 | -0.0283 | -1.208 | | | 12-4977-7801 | 12-6041-5309 |
| 9 | | Sep | 27 | 13:30 | 0.06853 | -0.007088 | -0.2537 | | | 10-5247-8130 | 18-3634-4932 |
| 10 | | Oct | 4 | 15:30 | 0.06117 | -0.01445 | -0.5467 | | | 04-6512-6656 | 12-0687-8134 |
| 11 | | Nov | 11 | 8:00 | 0.05179 | -0.02383 | -0.9759 | | | 07-2211-6064 | 11-1353-1786 |
| 12 | | Dec | 6 | 18:30 | 0.06146 | -0.01416 | -0.5347 | | | 15-0050-8702 | 18-1172-7708 |
| 13 | 2012 | Jan | 17 | 6:30 | 0.09035 | 0.01473 | 0.4587 | | | 16-8568-5103 | 05-2637-8931 |
| 14 | | | 31 | 6:30 | 0.08082 | 0.005195 | 0.1713 | | | 10-8162-6674 | 02-8617-5616 |
| 15 | | Feb | 21 | 15:00 | 0.05297 | -0.02265 | -0.9178 | | | 04-4655-6545 | 07-8323-3982 |
| 16 | | Mar | 5 | 15:30 | 0.08138 | 0.00576 | 0.1892 | | | 04-3538-5949 | 16-7246-4179 |
| 17 | | Apr | 3 | 15:00 | 0.06927 | -0.006357 | -0.2264 | | | 08-7328-7176 | 16-9970-4050 |
| 18 | | May1 | | 16:30 | 0.06343 | -0.0122 | -0.4534 | | | 08-3609-2102 | 11-7229-8074 |
| 19 | | Jun | 5 | 8:00 | 0.06356 | -0.01206 | -0.4478 | | | 07-6241-2351 | 16-9165-4736 |
| 20 | | Jul | 9 | 17:15 | 0.0872 | 0.01158 | 0.3673 | | | 16-8982-3937 | 16-8908-4413 |
| 21 | | Aug | 21 | 16:15 | 0.05179 | -0.02383 | -0.9759 | | | 03-2188-4750 | 04-0035-9708 |

*PSEUDOKIRSCHNERIELLA SUBCAPITATA 1003.0* **CHRONIC TOXICITY WORKSHEET**

| | | | |
|---|---|---|---|
| Lab ID | Reference Toxicant | Date/Time Start | 8.21.12 @ 1615 |
| Project | Cadmium Chloride | Date/Time End | 8.25.12 @ 1630 |

**Cell Density Measured by hemocytometer**

| | | | | |
|---|---|---|---|---|
| Initial Cell Density , cells/mL: | 1.0 x 104 | | | |
| Final Cell Density (average of 4 control replicates), cells/mL: | 2.04 x 107 | | | |
| Cell Density in each control replicate , cells/mL | A 2.10 x 107 | B 1.97 x 107 | C 2.09 x 107 | D 1.98 x 10^7 |

## END OF TEST MEASUREMENTS

**ABSORBANCE BY SPECTROPHOTOMETER @** 750 **nm**

| ug/L | Replicate A | B | C | D |
|---|---|---|---|---|
| CONTROL | 0.119 | 0.121 | 0.120 | 0.116 |
| 20.0 | 0.123 | 0.118 | 0.119 | 0.121 |
| 40.0 | 0.122 | 0.120 | 0.125 | 0.120 |
| 60.0 | 0.099 | 0.093 | 0.100 | 0.099 |
| 80.0 | 0.075 | 0.059 | 0.069 | 0.071 |
| 100.0 | 0.041 | 0.035 | 0.040 | 0.039 |

**START OF TEST PHYSICAL/CHEMICAL MEASUREMENTS**

| ug/L | ALK | TOT-HRD | EC @ 25 | pH |
|---|---|---|---|---|
| CONTROL | 12 | 14 | 70 | 7.4 |
| 20.0 | | | | 7.4 |
| 40.0 | | | | 7.4 |
| 60.0 | | | | 7.4 |
| 80.0 | | | | 7.3 |
| 100.0 | | | 70 | 7.3 |

FLASKS SHAKEN BY HAND 2X/DAY TIME OF MEASUREMENTS INDICATED BY X

| DATE | 8.21.12 | 8.22.12 | 8.23.12 | 8.24.12 | 8.25.12 |
|---|---|---|---|---|---|
| TIME 1 | | 0615 | 0545 | 0555 | 0520 |
| TIME 2 | 1615X | 1550X | 1540X | 1605X | 1630X |
| ug/L | DAY 0 pH/Temp | DAY 1 pH/Temp | DAY 2 pH/Temp | DAY 3 pH/Temp | DAY 4 pH/Temp |
| **Control** | 25.1 | 8.4 24.9 | 8.6 25.3 | 8.9 24.6 | 9.1 25.7 |
| **20.0** | 25.1 | 8.5 25.0 | 8.6 25.1 | 8.9 24.7 | 9.2 25.8 |
| **40.0** | 25.1 | 8.5 24.7 | 8.6 24.8 | 8.9 24.9 | 9.2 25.9 |
| **60.0** | 25.1 | 8.2 24.6 | 8.2 24.9 | 8.2 25.0 | 8.3 24.7 |
| **80.0** | 25.1 | 8.1 24.3 | 8.1 25.6 | 8.2 25.1 | 8.3 24.5 |
| **100.0** | 25.1 | 8.0 24.2 | 8.0 24.1 | 7.9 25.2 | 8.0 25.2 |

**DILUTION/CULTURE WATER PREPARED ON/BY:** 8.21.12 ba

**SAMPLE FILTERED BY** n/a **ON**

**OTHER CONDITIONS/NOTES**

**AQUATIC CONSULTING & TESTING, INC.** **ANALYST:** Beth Atkinson