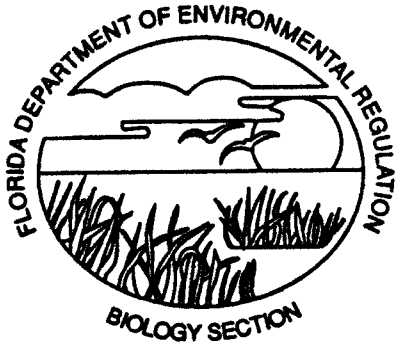



Bioassays of

# Arlington East Sewage Treatment Plant

Jacksonville, Duval County, Florida

NPDES #FL0026441

Sampled 4/2/91

May 2, 1991

**Biology Section**
**Division of Administrative and Technical Services**

Bioassays of

# Arlington East Sewage Treatment Plant

Jacksonville, Duval County, Florida

NPDES #FL0026441

**Biology Section**
**Bureau of Laboratories**
**May 2, 1991**

## Introduction

Arlington East STP, Jacksonville, Duval County, Florida, NPDES #FL0026441, on 3 to 5 April, 1991.

This facility is located at 1555 Millcoe Road in Jacksonville. Sewage treatment includes screening, grit removal, primary clarification, aeration, secondary clarification, and chlorination. The facility has a design capacity of 10 MGD and average flow is 3 MGD. Effluent is discharged to the St. Johns River.

The toxicity tests discussed in this report were performed in accordance with methods described by Peltier and Weber, 1985, *Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms*, 3rd Edition, and by the FDER Biology Section, 1985, *Quality Assurance Manual for Performing Acute Toxicity Tests*, 2nd Edition.

## Results and Discussion

The Biology Section performed static bioassays on a sample of chlorinated discharge from this facility using the bioassay test organisms, the waterflea, *Ceriodaphnia dubia*, and the fish, *Notropis leedsi*. The sample proved toxic in the acute screening bioassays to both test species, producing $LC_{50}$'s of < 100%. The sodium thiosulfate method was used to dechlorinate a portion of the sample. The acute definitive bioassays performed on the dechlorinated sample indicated that the sample was not toxic to *C. dubia* or *N. leedsi*.

The toxicity in the discharge sample was attributed to the total residual chlorine concentration of 0.5 mg/L (Hach). Ammonia was not detected in the sample. No further chemical analyses were performed on the sample.

## Conclusion

The sample of discharge from this facility was toxic on 2 April, 1991. The cause of this toxicity was attributed to the total residual chlorine in the sample.

**Table 1. Concentration Series and Volumes Used for the Arlington East STP Static Bioassays, April 3-5, 1991.**

*Ceriodaphnia dubia* (water flea)

| Concentration | Dilution Water | Sample | Total Volume |
|---|---|---|---|
| Control | 20.0 mL | 0.0 mL | 20.0 mL |
| 10.0% | 18.0 mL | 2.0 mL | 20.0 mL |
| 30.0% | 14.0 mL | 6.0 mL | 20.0 mL |
| 50.0% | 10.0 mL | 10.0 mL | 20.0 mL |
| 70.0% | 6.0 mL | 14.0 mL | 20.0 mL |
| 85.0% | 3.0 mL | 17.0 mL | 20.0 mL |
| 100.0% | 0.0 mL | 20.0 mL | 20.0 mL |

*Notropis leedsi* (bannerfin shiner)

| Concentration | Dilution Water | Sample | Total Volume |
|---|---|---|---|
| Control | 500 mL | 0 mL | 500 mL |
| 50.0% | 250 mL | 250 mL | 500 mL |
| 100.0% | 0 mL | 500 mL | 500 mL |

Table 2. Data recorded during the static acute bioassay of a sample of discharge from the Arlington East STP, Jacksonville, Duval County, Florida, NPDES#0026441, on 3 to 5 April, 1991.

Facility: **Arlington East Sewage Treatment Plant** NPDES # **FL0026441** Facility Type: **Sewage Treatment**
Location: 1555 Millcoe Rd., Jacksonville Contact/District: S. Bulgrin
County: Duval Test type: static definitive
Sample Collection Date: **4/2/91** Time: 1100 # tests: 2 Receiving Water: St. Johns River
Test Beginning Date: 4/3/91 Time: 1345 Chlorination Type: **dechlorinated**
Test Ending Date: 4/5/91 Time: 1300 Dechlor method: lab, sodium thiosulfate **Page 1 of 2**

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
**LC50:** - Binomial: - Moving Average: - Probit: -

| | SURVIVAL | | | Dissolved Oxygen | | | pH | | | Temperature | | | Conductivity | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Concentrations | # at 0 hr | Live at 24 hr | Live at 48 hr | 0 hour | 24 hour | 48 hour | 0 hour | 24 hour | 48 hour | 0 hour | 24 hour | 48 hour | 0 hour | 48 hour |
| Control | 5 | 5 | 5 | 9.1 | 8.1 | 8.9 | 7.6 | 7.8 | 8.0 | 21.3 | 21.5 | 21.3 | 145 | 158 |
| Control | 5 | 5 | 4 | - | - | - | - | - | - | - | - | - | - | - |
| Control | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| Control | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 10% | 5 | 5 | 5 | 9.1 | 8.2 | 8.9 | 7.6 | 8.0 | 8.1 | 21.5 | 21.3 | 21.3 | 239 | 239 |
| 10% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 10% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 10% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 30% | 5 | 5 | 5 | 9.2 | 8.2 | 8.9 | 7.6 | 8.1 | 8.1 | 21.3 | 21.3 | 21.3 | 426 | 428 |
| 30% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 30% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 30% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 50% | 5 | 5 | 5 | 9.3 | 8.2 | 8.9 | 7.5 | 8.2 | 8.3 | 21.1 | 21.3 | 21.2 | 595 | 595 |
| 50% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 50% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 50% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 70% | 5 | 5 | 5 | 9.4 | 8.2 | 8.9 | 7.5 | 8.3 | 8.4 | 21.0 | 21.3 | 21.2 | 771 | 770 |
| 70% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 70% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 70% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 85% | 5 | 5 | 5 | 9.4 | 8.2 | 8.9 | 7.5 | 8.4 | 8.5 | 20.8 | 21.3 | 21.2 | 891 | 903 |
| 85% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 85% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 85% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 100% | 5 | 5 | 5 | 9.4 | 8.2 | 8.9 | 7.4 | 8.4 | 8.5 | 20.7 | 21.3 | 21.2 | 1012 | 1029 |
| 100% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 100% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| 100% | 5 | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - |

| Total Residual Cl2 | mg/l | Method |
|---|---|---|
| Field: | 0.7 | Hach |
| Lab: | 0.5 | Hach |
| Lab: | 0.35 | Iodometric |

| Ammonia | Total (mg/l) | Unionized (mg/l) |
|---|---|---|
| Control Water (fish): | 0.00 | 0.00 |
| Cond. Control Water (daphnids): | 0.00 | 0.00 |
| 100% Sample: | 0.00 | 0.00 |

| Alk & Hardness | Alkalinity (mg/l) | Hardness (mg/l) |
|---|---|---|
| Control Water (fish): | 115 | 125 |
| Cond. Control Water (daphnids): | 55 | 70 |
| 100% Sample: | 140 | 260 |



"continued"

Table 2. Continued

Facility: **Arlington East Sewage Treatment Plant** NPDES # **FL0026441** Facility Type: **Sewage Treatment**
Location: 1555 Millcoe Rd., Jacksonville Contact/District: S. Bulgrin
County: Duval Test type: static screen
Sample Collection Date: **4/2/91** Time: 1100 # tests: 2 Receiving Water: St. Johns River
Test Beginning Date: 4/3/91 Time: 1345 Chlorination Type: **dechlorinated**
Test Ending Date: 4/5/91 Time: 1300 Dechlor method: lab, sodium thiosulfate **Page 2 of 2**

Organism: ***Notropis leedsi*** Age: 13-15 days
LC50: - Binomial: - Moving Average: - Probit: -

| Concentrations | SURVIVAL # at 0 hr | Live at 24 hr | Live at 48 hr | Dissolved Oxygen 0 hour | 24 hour | 48 hour | pH 0 hour | 24 hour | 48 hour | Temperature 0 hour | 24 hour | 48 hour | Conductivity 0 hour | 48 hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 5 | 5 | 5 | 9.3 | 8.1 | 8.6 | 7.6 | 8.1 | 8.2 | 20.5 | 20.5 | 21.0 | - | - |
| Control | 5 | 5 | 5 | 9.3 | 8.1 | 8.6 | 7.6 | 8.1 | 8.3 | - | - | - | 239 | 245 |
| 50% | 5 | 5 | 5 | 9.4 | 8.0 | 8.4 | 7.5 | 8.0 | 8.2 | 20.8 | 20.5 | 20.8 | - | - |
| 50% | 5 | 5 | 5 | 9.4 | 8.0 | 8.4 | 7.5 | 8.0 | 8.2 | - | - | - | 642 | 653 |
| 100% | 5 | 5 | 5 | 9.7 | 8.0 | 8.2 | 7.4 | 8.0 | 8.2 | 21.2 | 20.5 | 20.8 | - | - |
| 100% | 5 | 5 | 5 | 9.7 | 7.9 | 8.2 | 7.4 | 8.0 | 8.2 | - | - | - | 1042 | 1041 |

| Total Residual Cl2 | mg/l | Method |
|---|---|---|
| Field: | 0.65 | Hach |
| Lab: | 0.50 | Hach |
| Lab: | 0.35 | Iodometric |

| Ammonia | Total (mg/l) | Unionized (mg/l) |
|---|---|---|
| Control Water (fish): | 0.00 | 0.00 |
| Cond. Control Water (daphnids): | 0.00 | 0.00 |
| 100% Sample: | 0.00 | 0.00 |

| Alk & Hardness | Alkalinity (mg/l) | Hardness (mg/l) |
|---|---|---|
| Control Water (fish): | 115 | 125 |
| Cond. Control Water (daphnids): | 55 | 70 |
| 100% Sample: | 140 | 260 |

Table 3. Data recorded during the static acute bioassay of a sample of chlorinated discharge from the Arlington East STP, Jacksonville, Duval County, Florida, NPDES#0026441, on 3 to 5 April, 1991.

Facility: **Arlington East Sewage Treatment Plant** NPDES # **FL0026441** Facility Type: **Sewage Treatment**
Location: 1555 Millcoe Rd., Jacksonville Contact/District: S. Bulgrin
County: Duval Test type: static screen
Sample Collection Date: **4/2/91** Time: 1100 # tests: 2 Receiving Water: St. Johns River
Test Beginning Date: 4/3/91 Time: 1345 Chlorination Type: **chlorinated**
Test Ending Date: 4/5/91 Time: 1300 **Page 1 of 1**

Organism: ***Ceriodaphnia dubia*** Life stage: neonate
**LC50: <100%**

| Concentrations | SURVIVAL # at 0 hr | Live at 24 hr | Live at 48 hr | Dissolved Oxygen 0 hour | 24 hour | 48 hour | pH 0 hour | 24 hour | 48 hour | Temperature 0 hour | 24 hour | 48 hour | Conductivity 0 hour | 24 hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 5 | 5 | - | 9.1 | 8.1 | - | 7.6 | 7.8 | - | 21.3 | 21.5 | - | 145 | 160 |
| Control | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Control | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - | - |
| Control | 5 | 5 | - | - | - | - | - | - | - | - | - | - | - | - |
| 100% | 5 | 0 | - | 8.8 | 8.2 | - | 7.2 | 8.4 | - | 20.0 | 21.6 | - | 1002 | 1022 |
| 100% | 5 | 0 | - | - | - | - | - | - | - | - | - | - | - | - |
| 100% | 5 | 0 | - | - | - | - | - | - | - | - | - | - | - | - |
| 100% | 5 | 0 | - | - | - | - | - | - | - | - | - | - | - | - |

Organism: ***Notropis leedsi*** Age: 13-15 days
**LC50: <100%**

| Concentrations | SURVIVAL # at 0 hr | Live at 24 hr | Live at 48 hr | Dissolved Oxygen 0 hour | 24 hour | 48 hour | pH 0 hour | 24 hour | 48 hour | Temperature 0 hour | 24 hour | 48 hour | Conductivity 0 hour | 48 hour |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 5 | 5 | 5 | 9.3 | 8.1 | 8.6 | 7.6 | 8.1 | 8.2 | 20.5 | 20.5 | 21.0 | - | - |
| Control | 5 | 5 | 5 | 9.3 | 8.1 | 8.6 | 7.6 | 8.1 | 8.3 | - | - | - | 239 | 245 |
| 100% | 5 | 1 | 0 | 9.2 | 8.1 | 7.2 | 7.3 | 8.0 | 8.1 | 21.1 | 21.0 | 20.8 | - | - |
| 100% | 5 | 2 | 2 | 9.2 | 8.2 | 7.6 | 7.3 | 8.0 | 8.1 | - | - | - | 1042 | 1044 |

| Total Residual Cl2 | mg/l | Method |
|---|---|---|
| Field: | 0.65 | Hach |
| Lab: | 0.50 | Hach |
| Lab: | 0.35 | Iodometric |

| Ammonia | Total (mg/l) | Unionized (mg/l) |
|---|---|---|
| Control Water (fish): | 0.00 | 0.00 |
| Cond. Control Water (daphnids): | 0.00 | 0.00 |
| 100% Sample: | 0.00 | 0.00 |

| Alk & Hardness | Alkalinity (mg/l) | Hardness (mg/l) |
|---|---|---|
| Control Water (fish): | 115 | 125 |
| Cond. Control Water (daphnids): | 55 | 70 |
| 100% Sample: | 140 | 260 |

Table 4. $LC_{50}$ Data for Bioassay of Arlington East WWTP, on 3 to 5 April, 1991.

| Organism | Method of Data Analysis | $LC_{50}$ |
|---|---|---|
| **Chlorinated discharge** | | |
| *Ceriodaphnia dubia* | not calculated | <100% [a] |
| *Notropis leedsi* | not calculated | <100% [a] |

a The $LC_{50}$ is < 100% since all the organisms died in the lowest test concentration (100%).

# DER Biology Section — Acute Bioassay Bench Sheet (107)

**Sample Source:** Arlington East WWTP
**Address/City:** Jacksonville
**County:** Duval
**Contact/District:** Scott Sajgin
**NPDES Permit #:** FL0026441 **Outfall #:**

**Sample Collection:** Date 7/01/91 Time 1100
**Test Beginning:** Date 7/03/91 Time 1345
**Test Ending:** Date 7/05/91 Time 1300
**Test Organism:** Ceriodaphnia dubia
**Life Stage/Age:** 24 hours

**Test Number:** 1 of 4 **Test Type:** Screening | Definitive
Static | Static Renewal | Flow-through

**Remarks:**
DE - chlorinated replicates

**Instrument Calibrations:**

| | pH | DO | Cond | Temp |
|---|---|---|---|---|
| 0 hr | 7@7.96 | 8.9@21.5 | 216@23.7 | 1501@24.1 |
| 24 hr | 7@7.99 | 8.8@22.5 | 21.8@23.9 | 1495@24.0 |
| 48 hr | 7@7.96 | 9.0@21.6 | 21.0@23.4 | 1476@23.5 |

| Conc. | Chamber # | Number Live 0 | 24 | 48 | DO (mg/l) 0 | 24 | 48 | pH 0 | 24 | 48 | Temp (°C) 0 | 24 | 48 | Cond. (µmhos/cm) 0 | 24 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | | 5 | 5 | 5 | 9.1 | 8.1 | 8.9 | 7.6 | 7.8 | 8.0 | 21.3 | 21.5 | 21.3 | 145 | 160 | 158 |
| Control | | 5 | 5 | 4 | | | | | | | | | | | | |
| Control | | 5 | 5 | 5 | | | | | | | | | | | | |
| Control | | 5 | 5 | 5 | | | | | | | | | | | | |
| 10% | | 5 | 5 | 5 | 9.1 | 8.2 | 8.9 | 7.6 | 8.0 | 8.1 | 21.5 | 21.3 | 21.3 | 239 | 239 | 238 |
| 10% | | 5 | 5 | 5 | | | | | | | | | | | | |
| 10% | | 5 | 5 | 5 | | | | | | | | | | | | |
| 10% | | 5 | 5 | 5 | | | | | | | | | | | | |
| 30% | | 5 | 5 | 5 | 9.2 | 8.2 | 8.9 | 7.6 | 8.1 | 8.1 | 21.3 | 21.3 | 21.3 | 426 | 424 | 424 |
| 30 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 30 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 30 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 50 % | | 5 | 5 | 5 | 9.3 | 8.2 | 8.9 | 7.5 | 8.2 | 8.3 | 21.1 | 21.3 | 21.2 | 595 | 595 | 595 |
| 50 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 50 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 50 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 70 % | | 5 | 5 | 5 | 9.4 | 8.2 | 8.9 | 7.5 | 8.3 | 8.4 | 21.0 | 21.3 | 21.2 | 771 | 771 | 770 |
| 70 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 70 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 70 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 85 % | | 5 | 5 | 5 | 9.4 | 8.2 | 8.9 | 7.5 | 8.4 | 8.5 | 20.8 | 21.3 | 21.2 | 871 | 872 | |
| 85 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 85 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 85 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 100 % | | 5 | 5 | 5 | 9.4 | 8.2 | 8.9 | 7.4 | 8.4 | 9.5 | 20.7 | 21.3 | 21.2 | 1012 | 1033 | 1031 |
| 100 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 100 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| 100 % | | 5 | 5 | 5 | | | | | | | | | | | | |
| Measured/Loaded by: | | MA | MA | MA | MF | MF | MF | MF | MF | MF | MF | MF | MF | MF | MF | MF |
| Recorded by: | | MF | MF | MF | KP | AJ | SMF | KP | AJ | SMF | KP | AJ | MF | KP | AJ | SMF |

**Investigators' Signatures**

Marbel Faircloth

Lisa Jolcan

Stacy McClure

Reviewer

**Water-quality Parameters**

| | Well Water | Cond. Water | Sample | Method | Measured by |
|---|---|---|---|---|---|
| Flow Tot. Resid. Cl: | | | | | |
| Lab Tot. Resid. Cl: | | | 0.51 | HACH | MF |
| Alkalinity: | 115 | 25 | 14 | Hach | MF |
| Hardness: | 125 | 70 | 26 | Hach | MF |
| Total Ammonia: | 2 | 0 | 0 | Hach | KP |

Ammonia meter slope: Chem Brief 0 MF

Sample Source: Arlington EAST

Address/City:

County:

Contact/District:

NPDES Permit #: Outfall #:

Test Number: 2 of 4

Test Type: Screening | Definitive

Static | Static Renewal | Flow-through

Remarks: chlorinated

Sample Collection: Date 4/04/91 Time [illegible]

Test Beginning: Date 4/05/91 Time 1345

Test Ending: Date 4/09/91 Time 1300

Test Organism: C. dubia

Life Stage/Age: 24 hours

Instrument Calibrations:

| | pH | DO | Cond | Temp |
|---|---|---|---|---|
| 0 hr | 7@7, 9@9 | 8.9@21.5 | 21@23.7 | 1501@24.1 |
| 24 hr | 7@7, 9@9 | 8.75@22.5 | 1495@24.0° | 21.8@23.9 |
| 48 hr | | | | |

| Conc. | Chamber # | Number Live 0 | 24 | 48 | DO (mg/l) 0 | 24 | 48 | pH 0 | 24 | 48 | Temp. (°C) 0 | 24 | 48 | Cond. (µmhos/cm) 0 | 24 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (control) | SEE | CONTROLS | | | | | | | | | | | | | | |
| (control) | IN | TEST #1 | | | | | | | | | | | | | | |
| (control) | | | | | | | | 7.2 RD | | | | | | | | |
| (control) | | | | | 8.8 | 8.2 | | 8.1 | 34 | | 20.0 | 21.6 | | 1002 | 1022 | |
| 5% | | 5 | 0 | | | | | | | | | | | | | |
| 5% | | 5 | 0 | | | | | | | | | | | | | |
| 5% | | 5 | 0 | | | | | | | | | | | | | |
| 5% | | 5 | 0 | | | | | | | | | | | | | |
| 10% | | | | | | | | | | | | | | | | |
| 10% | | | | | | | | | | | | | | | | |
| 10% | | | | | | | | | | | | | | | | |
| 10% | | | | | | | | | | | | | | | | |
| 20% | | | | | | | | | | | | | | | | |
| Measured/Loaded by | | MF | MF | | MF | MF | | MF | MF | | MF | MF | | MF | MF | |
| Recorded by | | MF | MF | | KP | AJ | | KP | AJ | | KP | AJ | | KP | AJ | |

Investigators' Signatures

Water-quality Parameters

| | Well Water | Cond. Water | Sample | Method | Measured by |
|---|---|---|---|---|---|
| Field Tot. Resid. Cl2: | | | | | |
| Lab Tot. Resid. Cl2: | | | | | |
| Alkalinity: | 115 | 52 | 140 | Lab | AJ |
| Hardness: | 125 | 76 | 200 | Lab | AJ |
| Total Ammonia: | | | | | |

Ammonia meter slope:

# DER Biology Section — Acute Bioassay Bench Sheet

Sample Source: Arlington East
Address/City: Jacksonville
County: Duval
Contact/District: Scott Bulgin
NPDES Permit #: FL 0026441 Outfall #: 001

Sample Collection: Date 4/02/91 Time 1100
Test Beginning: Date 4/03/91 Time 1345
Test Ending: Date 4/09/91 Time 1300
Test Organism: M. bahia
Life Stage/Age: 13-15 days

Test Number: 3/4 of 4 Test Type: (Screening) | Definitive
Static | Static Renewal | Flow-through

Remarks: dechlorinated and Chlorinated tap screening

Instrument Calibrations.

| | pH | DO | Cond | Temp |
|---|---|---|---|---|
| 0 hr | | | | |
| 24 hr | | | | |
| 48 hr | | | | |

| Conc. | Chamber # | Number Live 0 | 24 | 48 | DO (mg/l) 0 | 24 | 48 | pH 0 | 24 | 48 | Temp. (°C) 0 | 24 | 48 | Cond. (µmhos/cm) 0 | 24 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control | 37 | 5 | 5 | 5 | 9.3 | 8.1 | 8.6 | 7.6 | 8.1 | 8.2 | 20.5 | 20.5 | 21.0 | | | |
| Control | 76 | 5 | 5 | 5 | 9.3 | 8.1 | 8.6 | 7.6 | 8.1 | 8.3 | | | | 239 | 241 | 245 |
| 50% | 63 | 5 | 5 | 5 | 9.4 | 8.0 | 8.4 | 7.5 | 8.0 | 8.2 | 20.8 | 20.5 | 20.9 | | | |
| 50% | 23 | 5 | 5 | 5 | 9.4 | 8.0 | 8.4 | 7.5 | 8.0 | 8.2 | | | | 246 | 645 | 653 |
| 100% | 79 | 5 | 5 | 5 | 9.7 | 8.0 | 8.2 | 7.4 | 8.0 | 8.2 | 21.2 | 20.5 | 20.9 | | | |
| 100% | 116 | 5 | 5 | 5 | 9.7 | 7.9 | 8.2 | 7.4 | 8.0 | 8.2 | | | | 1049 | 1031 | 1041 |
| | | | | | | | | | | | | | | | | |
| Control | ~~37~~ 27 | See dechlorinated control above | | | | | | | | | | | | | | |
| Control | | | | | | | | | | | | | | | | |
| 100% | 37 | 5 | 1 | 0 | 9.2 | 8.1 | 7.2 | 7.3 | 8.0 | 8.1 | 21.1 | 21.0 | 20.5 | | | |
| 100% | 48 | 5 | 2 | 2 | 9.2 | 8.2 | 7.6 | 7.3 | 8.0 | 8.2 | | | | 1049 | 1031 | 1041 |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Measured/Loaded by: | | MF | MF | SMC | MF | MF | MF | MF | MF | MF | MF | MF | MF | MF | MF | MF |
| Recorded by: | | MF | MF | SMC | KP | AJ | SMC | KP | AJ | SMC | KP | AJ | SMC | KP | KP | SMC |

Investigators' Signatures

Reviewer

Water quality Parameters

| | Well Water | Cond. Water | Sample | Method | Measured by |
|---|---|---|---|---|---|
| Field Tot Resid. Cl: | | | | | |
| Lab Tot Resid. Cl: | | | | | |
| Alkalinity: | 115 | 55 | 140 | Hach | MF |
| Hardness: | 125 | 70 | 260 | Hach | MF |
| Total Ammonia: | | | | | |

Ammonia meter slope: