



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

July 9, 2003

State of Tennessee  
Department of Environment and Conservation  
Division of Water Pollution Control  
Enforcement & Compliance Section  
6<sup>th</sup> Floor, L & C Annex  
401 Church Street  
Nashville, Tennessee 37243-1534

Attention: Mr. Chip Hannah

Dear Mr. Hannah:

**SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR JUNE 2003**

Enclosed is the June 2003 Discharge Monitoring Report for Sequoyah Nuclear Plant. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

A handwritten signature in cursive script that reads "Stephanie A. Howard".

Stephanie A. Howard  
Acting Environmental Supervisor  
Signatory Authority for  
Richard T. Purcell  
Site Vice President  
Sequoyah Nuclear Plant

Enclosure

cc (Enclosure):

Chattanooga Environmental Assistance Center  
Division of Water Pollution Control  
State Office Building, Suite 550  
540 McCallie Avenue  
Chattanooga, Tennessee 37402-2013

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

JE25

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
 Name **TVA - SEQUOYAH NUCLEAR PLANT**  
 Address **P.O. BOX 2000**  
 (INTEROFFICE SB-2A)  
**SODDY - DAISY TN 37384**  
 Facility **TVA - SEQUOYAH NUCLEAR PLANT**  
 Location **HAMILTON COUNTY**

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
 DISCHARGE MONITORING REPORT (DMR)

TN0026450		101 G	
PERMIT NUMBER		DISCHARGE NUMBER	

MONITORING PERIOD  
 From 

YEAR	MO	DAY
03	06	01

 To 

YEAR	MO	DAY
03	06	30

MAJOR (SUBR 01)  
 F - FINAL  
 DIFFUSER DISCHARGE  
 EFFLUENT  
 \*\*\* NO DISCHARGE ☐ \*\*\*  
 NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	26.9	04	0	30 / 30	MODEL
00010 Z 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	30.5	DEG. C.		SEE PERMIT	CK REQ
INSTREAM MONITORING							DAILY MX				
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	39.9	04	0	30 / 30	RCORDR
00010 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT	DEG. C.		SEE PERMIT	CK REQ
EFFLUENT GROSS VALUE							DAILY MX				
PH	SAMPLE MEASUREMENT	*****	*****	**	7.2	*****	7.4	12	0	8 / 30	GRAB
00400 1 0 0	PERMIT REQUIREMENT	*****	*****	****	6.0	*****	9.0	SU		WEEKLY	GRAB
EFFLUENT GROSS VALUE					MINIMUM		MAXIMUM				
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	7	8	19	0	4 / 30	GRAB
00530 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	30	100	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE						MO AVG	DAILY MX				
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	<5	<5	19	0	4 / 30	GRAB
00556 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	15	20	MG/L		WEEKLY	GRAB
EFFLUENT GROSS VALUE						MO AVG	DAILY MX				
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	*****	1667	03	*****	*****	*****	**	0	30 / 30	RCORDR
50050 1 0 0	PERMIT REQUIREMENT	*****	REPORT	MGD	*****	*****	*****	****		CONTINUOUS	RCORDR
EFFLUENT GROSS VALUE			DAILY MX								
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.010	0.025	19	0	37 / 30	GRAB
50060 1 0 0	PERMIT REQUIREMENT	*****	*****	****	*****	0.036	0.058	MG/L		WEEK-DAYS	CALCTD
EFFLUENT GROSS VALUE							INST MAX				

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
Richard T. Purcell		423	843-6700	03	07	14
Site Vice President						
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)

Name TVA - SEQUOYAH NUCLEAR PLANT  
 Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
 Facility TVA - SEQUOYAH NUCLEAR PLANT  
 Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
 DISCHARGE MONITORING REPORT (DMR)

MAJOR  
 (SUBR 01)

Form Approved.  
 OMB No. 2040-0004

TN0026450 101 G  
 PERMIT NUMBER DISCHARGE NUMBER

F - FINAL  
 DIFFUSER DISCHARGE  
 EFFLUENT

MONITORING PERIOD  
 From YEAR MO DAY To YEAR MO DAY  
 03 06 01 03 06 30

\*\*\* NO DISCHARGE ☐ \*\*\*

NOTE: Read instructions before completing this form.

ATTN: Stephanie A. Howard

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.4	62	0	30 / 30	CALCTD
82234 1 0 0	PERMIT REQUIREMENT	*****	*****	***	*****	*****	2.0	DEG C /HR		CONTINUOUS	CALCTD
EFFLUENT GROSS VALUE											
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	2.1	04	0	30 / 30	CALCTD
00016 1 S 0	PERMIT REQUIREMENT	*****	*****	***	*****	*****	3.0	DEG. C.		CONTINUOUS	CALCTD
EFFLUENT GROSS VALUE											
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
BORON, TOTAL	SAMPLE MEASUREMENT	*****	*****	**	<0.2	<0.2	<0.2	19	0	1 / 30	GRAB
01022 1 0 0	PERMIT REQUIREMENT	*****	*****	***	REPORT	REPORT	REPORT	MG/L		ONCE/MONTH	GRAB
EFFLUENT GROSS VALUE											
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	<i>Stephanie A. Howard</i> Acting Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
Richard T. Purcell			423	843-6700	03	07	14
Site Vice President			AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED							

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

CCW data for June 2003 is attached. Quarterly veliger monitoring information is attached.

---

**CCW CHANNEL**

---

<b>Date/Time Collected</b>	<b>Extractable Petroleum Hydrocarbons</b>	<b>Analysis Date/Time</b>	<b>Analyst</b>
06/16/2003 0900	< 0.5 mg/L	06/19/2003 1942	JBR

---

---

**CCW TRENCH**

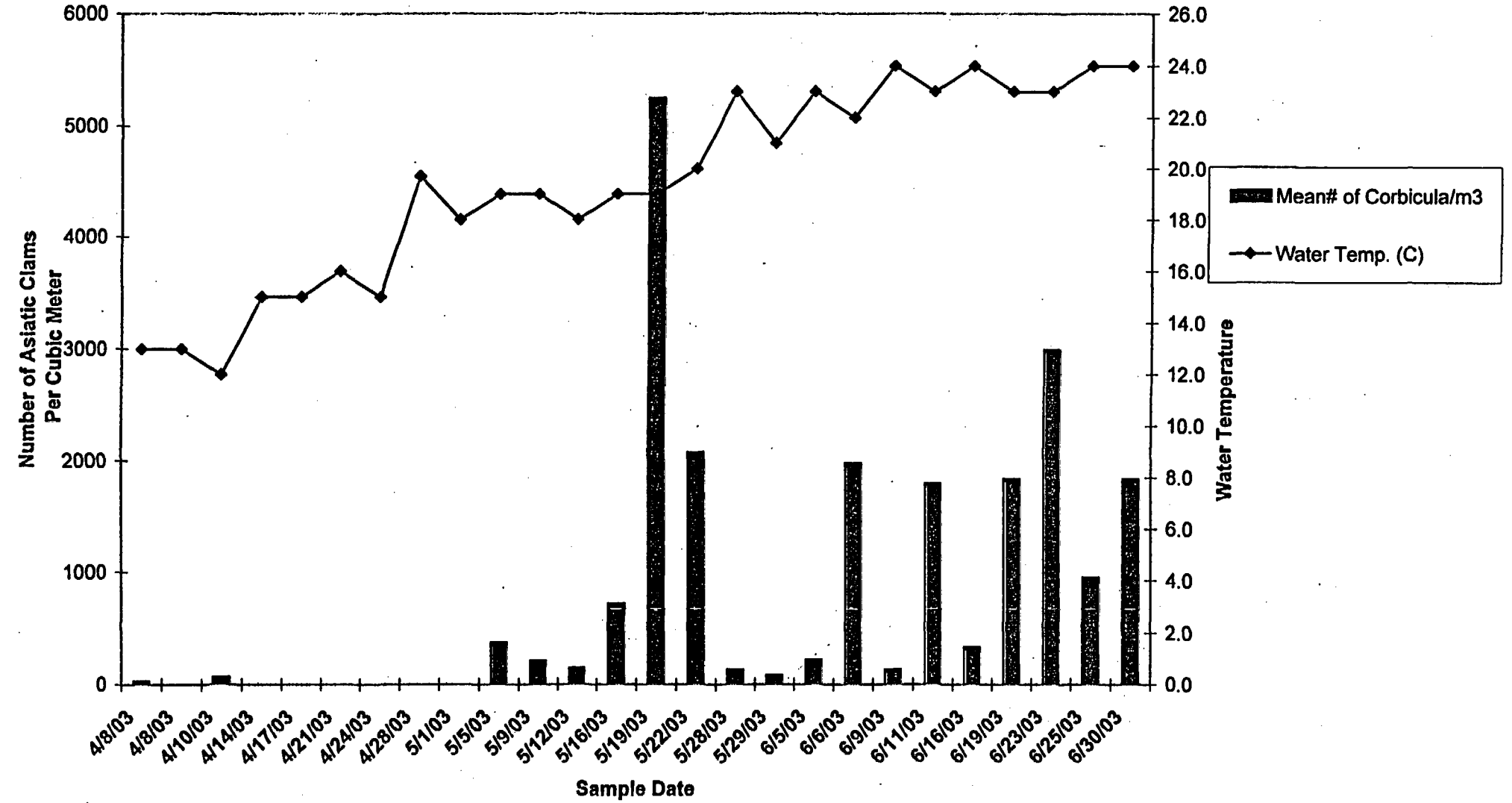
---

<b>Date/Time Collected</b>	<b>Extractable Petroleum Hydrocarbons</b>	<b>Analysis Date/Time</b>	<b>Analyst</b>
06/16/2003 0905	0.5 mg/L	06/19/2003 1905	JBR

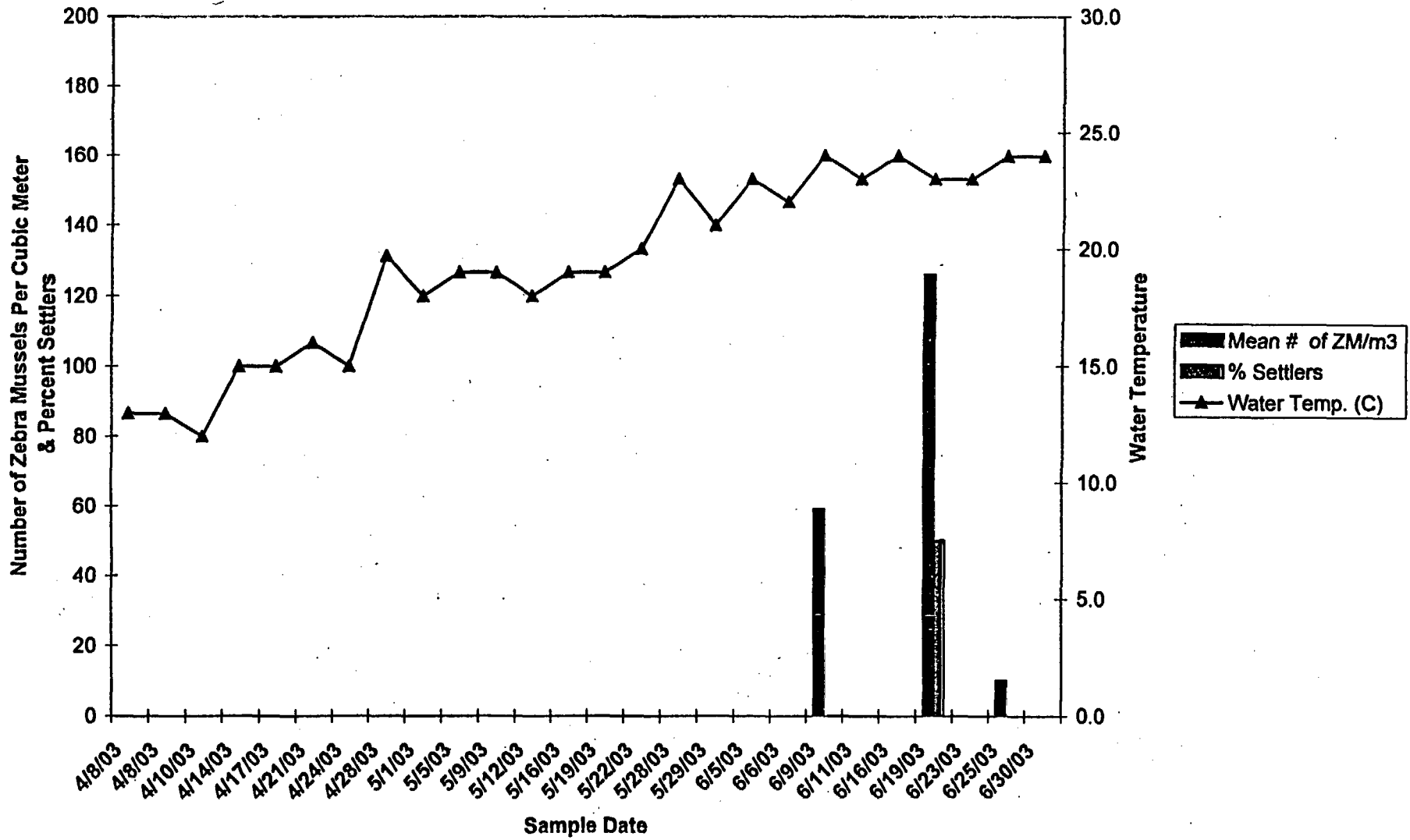
---

# SQN Forbay Clam Graph

## Sequoyah Nuclear Plant Forebay Clam Densities



# Sequoyah Nuclear Forbay Zebra Mussel Densities



Sample Date	Mean # of ZM/m <sup>3</sup>	% Settlers	Water Temp. (C)	Sample Date	Mean# of Corbicula/m <sup>3</sup>	Water Temp. (C)	LOCATION	SUB LOCATION	SAMPLE TYPE	COLLECTED BY
4/8/03	0	0	13.0	4/8/03	31	13.0	Intake	Intake Forebay	QUANT	Jones-Brier/Lehman
4/8/03	0	0	13.0	4/8/03	0	13.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery/Jones-Brier
4/10/03	0	0	12.0	4/10/03	68	12.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/14/03	0	0	15.0	4/14/03	0	15.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/17/03	0	0	15.0	4/17/03	0	15.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/21/03	0	0	16.0	4/21/03	0	16.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/24/03	0	0	15.0	4/24/03	0	15.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
4/28/03	0	0	19.7	4/28/03	0	19.7	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/1/03	0	0	18.0	5/1/03	0	18.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/5/03	0	0	19.0	5/5/03	379	19.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/9/03	0	0	19.0	5/9/03	213	19.0	Intake	Intake Forebay	QUANT	Ron Lowery/M.G. Beavers
5/12/03	0	0	18.0	5/12/03	144	18.0	Intake	Intake Forebay	QUANT	Ron Lowery/R.D. Nunley
5/16/03	0	0	19.0	5/16/03	720	19.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/19/03	0	0	19.0	5/19/03	5,248	19.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
5/22/03	0	0	20.0	5/22/03	2,074	20.0	Intake	Intake Forebay	QUANT	Ron Lowery/M.G. Beavers
5/28/03	0	0	23.0	5/28/03	129	23.0	Intake	Intake Forebay	QUANT	Ron Lowery/D. Angel
5/29/03	0	0	21.0	5/29/03	83	21.0	Intake	Intake Forebay	QUANT	Ron Lowery/D. Adcock
6/5/03	0	0	23.0	6/5/03	220	23.0	Intake	Intake Forebay	QUANT	Ron Lowery/E. Childers
6/6/03	0	0	22.0	6/6/03	1,976	22.0	Intake	Intake Forebay	QUANT	Ron Lowery/J.I. Childers
6/9/03	59	0	24.0	6/9/03	132	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/11/03	0	0	23.0	6/11/03	1,792	23.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/16/03	0	0	24.0	6/16/03	333	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/19/03	126	50	23.0	6/19/03	1833	23.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/23/03	0	0	23.0	6/23/03	2,991	23.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/25/03	10	0	24.0	6/25/03	955	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery
6/30/03	0	0	24.0	6/30/03	1832	24.0	Intake	Intake Forebay	QUANT	Wanda Allen/Ron Lowery

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
Name TVA - SEQUOYAH NUCLEAR PLANT  
Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
Facility TVA - SEQUOYAH NUCLEAR PLANT  
Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
DISCHARGE MONITORING REPORT (DMR)  
TN0026450  
PERMIT NUMBER  
101 T  
DISCHARGE NUMBER

MAJOR (SUBR 01)  
F - FINAL  
BIOMONITORING FOR OUTFALL 101  
EFFLUENT

Form Approved.  
OMB No. 2040-0004

ATTN: Stephanie A. Howard

MONITORING PERIOD  
From YEAR 03 MO 06 DAY 01 To YEAR 03 MO 06 DAY 30

\*\*\* NO DISCHARGE ☐ \*\*\*  
NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	*****	*****	**	>100	*****	*****	23	0	1 / 90	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QUART-ERLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	>100	*****	*****	23	0	1 / 90	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QUART-ERLY	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	03	07	14
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)  
An unscheduled whole effluent toxicity (WET) test was performed June 15-20, 2003 due to H-130M injection. Report is attached.



July 9, 2003

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT  
NO. TN0026450, H130M SPECIAL STUDY, JUNE, 2003

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101 samples collected June 15-20 showed no toxic effects to fathead minnows or daphnids. The resulting  $IC_{25}$  values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

In addition to the routine compliance test, fathead minnows were also tested in Outfall 101 and intake samples which were treated using UV exposure for pathogen removal prior to introduction of test organisms. Fish pathogens present in intake water have been the suspected cause of anomalous dose responses and high variability among replicates in previous toxicity testing at Sequoyah. At the time this study was conducted, mortality which occurred in minnows exposed to routine compliance samples and UV treated samples was not sufficient to jeopardize statistical validity.

Call me at (256) 386-2755 if you have any questions or comments following your review of the report.



Cynthia L. Russell

Biologist

Environmental Engineering Services- West

CEB 3A-M

Attachment

cc (Attachment):

Files, ER&TA, CEB 1B-M

SQN H130M-June 2003m

**TENNESSEE VALLEY AUTHORITY  
TOXICITY TEST REPORT**

**INTRODUCTION / EXECUTIVE SUMMARY**

Report Date: July 9, 2003

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN 0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: June 15 – 20, 2003
10. Average Flow on Days Sampled (MGD): 1585.5, 1592.5, 1557.0
11. Pertinent Site Conditions:

H130M was being injected from June 16- 22, 2003. The dates and times for the injection of H130M are provided below. The resulting H130M concentrations are summarized in Appendix B, along with other chemicals in use during sampling.

Injector Location	Date/Start Time (EDT)	Date/ Ending Time (EDT)
Essential Raw Cooling Water (ERCW)-Bravo Train	June 16, 2003/1010*	June 17, 2003/0840*
	June 17, 2003/0950*	June 18, 2003/0830*
	June 18, 2003/0940*	June 19, 2003/0910*
Raw Cooling Water (RCW)	June 19, 2003/1605	June 22, 2003/1425

\* The break between starting and ending times allowed for the back washing of ERCW traveling screens and strainers.

12. Test Dates: June 17 - 24, 2003
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)  
Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 10.98, 22, 43.9, 72, 100  
Intake: 100  
*Pimephales promelas*: UV treated Outfall 101: 10.98, 22, 43.9, 72, 100  
UV treated Intake: 100
16. Permit Limit Endpoint (%): Outfall 101: IC<sub>25</sub> = 43.9%
17. Test Results: Outfall 101: *Pimephales promelas*: IC<sub>25</sub> > 100  
*Ceriodaphnia dubia*: IC<sub>25</sub> > 100  
UV treated Outfall 101: *Pimephales promelas*: IC<sub>25</sub> > 100
18. Facility Contact: Ann Hurt  
Phone #: (423) 843-6714
19. Consulting / Testing Lab: Environmental Testing Solutions, LLC
20. Lab Contact: Jim Sumner  
Phone #: (828) 350-9364
21. TVA Contact: Cynthia L. Russell  
Phone #: (256) 386-2755
22. Notes: Outfall 101 samples collected June 15 - 20, 2003, showed no toxic effects to fathead minnows or daphnids. The resulting IC<sub>25</sub> values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples, suggesting that pathogenic bacteria were not present.

## METHODS SUMMARY

### Samples:

1. Sampling Point: Outfall 101, Intake
2. Sample Type: Composite
3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (EDT) Collected	Date (MM/DD/YY)/ Time (EDT) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (EDT) Used
101	06/15/03 1257 to 06/16/03 1157	06/17/03 0946	0.4 <sup>†</sup>	<0.10	06/17/03 1422 06/18/03 1330
Intake	06/15/03 1135 to 06/16/03 1235	06/17/03 0946	0.4	<0.10	06/17/03 1422 06/18/03 1330
101	06/17/03 1402 to 06/18/03 1302	06/19/03 0939	0.7 <sup>†</sup>	<0.10	06/19/03 1336 06/20/03 1400
Intake	06/17/03 1348 to 06/18/03 1248	06/19/03 0939	0.4	<0.10	06/19/03 1336 06/20/03 1400
101	06/19/03 1256 to 06/20/03 1156	06/21/03 1004	0.9 <sup>†</sup>	<0.10	06/21/03 1340 06/22/03 1342 06/23/03 1338
Intake	06/19/03 1233 to 06/20/03 1133	06/21/03 1004	2.1	<0.10	06/21/03 1340 06/22/03 1342 06/23/03 1338

\*TRC = Total Residual Chlorine

<sup>†</sup>Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

4. Sample Manipulation: Samples from Outfall 101 and the Intake were warmed to test temperature (25.0 ± 1.0°C) in a warm water bath.  
  
Aliquots of Outfall 101 and Intake samples were UV-treated through a 40-watt Rainbow Lifeguard® UV Sterilizer for 2 minutes.

	<u><i>Pimephales promelas</i></u>	<u><i>Ceriodaphnia dubia</i></u>
<u>Test Organisms:</u>		
1. Source:	<u>Aquatic BioSystems, Inc.</u>	<u>In-house Cultures</u>
2. Age:	<u>23.5-25.5-hours old</u>	<u>&lt; 24-hours old</u>
<u>Test Method Summary:</u>		
1. Test Conditions:	<u>Static, Renewal</u>	<u>Static, Renewal</u>
2. Test Duration:	<u>7 days</u>	<u>Until at least 60% of control females have 3 broods</u>
3. Control / Dilution Water:	<u>Moderately Hard Synthetic</u>	<u>Moderately Hard Synthetic</u>
4. Number of Replicates:	<u>4</u>	<u>10</u>
5. Organisms per Replicate:	<u>10</u>	<u>1</u>
6) Test Initiation: (Date/Time)		
Outfall 101	<u>06/17/03-1422 EDT</u>	<u>06/17/03-1314 EDT</u>
UV Treated Outfall 101	<u>06/17/03-1440 EDT</u>	
7) Test Termination: (Date/Time)		
Outfall 101	<u>06/24/03-1440 EDT</u>	<u>06/24/03-1300 EDT</u>
UV Treated Outfall 101	<u>06/24/03-1505 EDT</u>	
8) Test Temperature: Outfall 101:	<u>Mean = 24.9°C</u> <u>(24.3-25.5°C)</u>	<u>Mean = 24.7°C</u> <u>(24.3-25.6°C)</u>
Test Temperature: UV-Treated Outfall 101:	<u>Mean = 24.9°C</u> <u>(24.3-25.7°C)</u>	
9. Physical / Chemical Measurements:	<u>Alkalinity, hardness, total residual chlorine, and conductivity were measured at the laboratory in each 100% sample. Daily temperatures were measured in one replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.</u>	
10. Statistics:	<u>Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).</u>	

# **TOXICITY TEST RESULTS** (see Appendix C for Bench Sheets)

1. Results of a *Pimephales promelas* Chronic 7-day Toxicity Test.  
(Genus species) (Type / Duration)

Conducted June 17- 24, 2003 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	98	98	98	98	98	98
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	98	98	98	98

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.886	0.778	0.763	0.915	0.835
10.98%	0.799	0.739	0.711	0.833	0.771
22%	0.970	0.806	0.863	0.960	0.900
43.9%	0.941	0.964	0.964	0.968	0.959
72%	0.890	0.925	0.942	1.027	0.946
100%	0.944	0.915	0.952	0.816	0.907
Intake	0.843	0.923	0.798	0.919	0.871
IC <sub>25</sub> Value: <u>&gt; 100%</u> Permit Limit: <u>43.9</u>			Calculated TU Estimates: <u>&lt; 1.0 TUc*</u>		
95% Confidence Limits: Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>			Permit Limit: <u>2.3 TUc</u>		

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

**TOXICITY TEST RESULTS** (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic 7-day Toxicity Test.  
(Genus species) (Type / Duration)

Conducted June 17- 24, 2003 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	30	30	23	27	28	30	26	29	24	29	27.6
10.98%	27	29	24	30	28	30	33	28	31	31	29.1
22%	31	30	34	29	37	28	28	30	32	28	30.7
43.9%	35	31	34	31	32	35	32	29	33	36	32.8
72%	34	29	35	30	36	31	33	33	30	36	32.7
100%	37	34	32	33	35	36	35	37	31	35	34.5
Intake	28	29	33	31	29	30	29	27	29	33	29.8
IC <sub>25</sub> Value: <u>&gt; 100%</u> Permit Limit: <u>43.9</u>				Calculated TU Estimates: <u>&lt; 1.0 TUc*</u>							
95% Confidence Limits: Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>				Permit Limit: <u>2.3 TUc</u>							

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

**TOXICITY TEST RESULTS, UV-TREATED** (see Appendix C for Bench Sheets)

3. Results of a *Pimephales promelas* Chronic 7-day Toxicity Test.  
(Genus species) (Type / Duration)

Conducted June 17 - 24, 2003 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	98	98	98	98	98	98
22%	100	98	98	98	98	98	98
43.9%	100	100	100	100	100	100	100
72%	100	98	98	98	98	98	98
100%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.722	0.769	0.830	0.923	0.811
10.98%	0.840	0.831	0.912	0.944	0.881
22%	0.974	0.880	0.837	0.942	0.908
43.9%	0.822	0.853	0.945	0.898	0.880
72%	0.909	1.045	1.009	0.971	0.983
100%	1.002	0.938	0.886	0.745	0.893
Intake	0.860	0.916	0.924	1.048	0.937
IC <sub>25</sub> Value: <u>&gt; 100%</u>  95% Confidence Limits: <u>NA</u> Upper Limit: <u>NA</u> Lower Limit: <u>NA</u>			Calculated TU Estimates: <u>≤ 1.0 TUc*</u>  Permit Limit: <u>NA</u>		

\*TUa = 100/LC<sub>50</sub>; TUc = 100/ IC<sub>25</sub>

**REFERENCE TOXICANT TEST RESULTS** (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC <sub>25</sub> )
<i>Pimephales promelas</i>	June 17, 2003	1346	7-days	KCl	602.2 mg/L
<i>Ceriodaphnia dubia</i>	June 04, 2003	1310	7-days	NaCl	1068.7 mg/L



# PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, June 17-24, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L CaCO <sub>3</sub> )	Hardness (mg/L CaCO <sub>3</sub> )	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
<i>Pimephales promelas</i>	Control	25.3	24.6	7.6	7.3	7.72	7.56	301	60.9	84.1	-
		25.1 - 25.5	24.3 - 24.7	7.6 - 7.7	6.5 - 7.7	7.63 - 7.80	7.36 - 7.73	290 - 317	60.2 - 61.2	82.8 - 84.8	-
	10.98%	25.3	24.6	7.7	7.3	7.71	7.56	287	-	-	-
		25.0 - 25.5	24.3 - 24.7	7.5 - 7.9	6.5 - 7.6	7.67 - 7.76	7.44 - 7.69	276 - 301	-	-	-
	22%	25.3	24.6	7.7	7.3	7.71	7.56	276	-	-	-
		25.0 - 25.5	24.3 - 24.7	7.5 - 7.9	6.6 - 7.7	7.67 - 7.75	7.46 - 7.69	265 - 284	-	-	-
	43.9%	25.3	24.6	7.8	7.4	7.67	7.55	243	-	-	-
		25.0 - 25.5	24.3 - 24.7	7.6 - 7.9	6.7 - 7.8	7.64 - 7.71	7.43 - 7.67	233 - 248	-	-	-
<i>Ceriodaphnia dubia</i>	Control	25.2	24.6	7.8	7.4	7.62	7.55	206	-	-	-
		24.8 - 25.5	24.3 - 24.7	7.6 - 7.9	6.7 - 7.8	7.56 - 7.69	7.48 - 7.67	199 - 215	-	-	-
	100%	25.3	24.6	7.8	7.4	7.56	7.51	166	57.4	64.0	<0.10
		24.7 - 25.5	24.3 - 24.7	7.6 - 8.0	6.9 - 7.6	7.43 - 7.66	7.42 - 7.64	164 - 169	57.1 - 58.1	62.6 - 66.7	<0.10 - <0.10
	Intake	25.2	24.6	7.9	7.4	7.55	7.50	164	57.8	63.3	<0.10
		24.9 - 25.5	24.3 - 24.7	7.8 - 8.0	6.8 - 7.8	7.47 - 7.67	7.41 - 7.64	161 - 168	57.1 - 58.1	62.6 - 64.6	<0.10 - <0.10
	Control	25.0	24.4	7.6	7.9	7.72	7.83	301	60.9	84.1	-
		24.5 - 25.6	24.3 - 24.5	7.6 - 7.7	7.7 - 8.2	7.63 - 7.80	7.72 - 7.92	290 - 317	60.2 - 61.2	82.8 - 84.8	-
<i>Pimephales promelas</i>	10.98%	25.0	24.4	7.7	7.9	7.71	7.86	287	-	-	-
		24.5 - 25.6	24.3 - 24.5	7.5 - 7.8	7.6 - 8.3	7.67 - 7.76	7.73 - 7.97	276 - 301	-	-	-
	22%	25.0	24.4	7.7	7.9	7.71	7.85	276	-	-	-
		24.5 - 25.6	24.3 - 24.5	7.5 - 7.9	7.6 - 8.4	7.67 - 7.75	7.73 - 7.96	265 - 284	-	-	-
	43.9%	25.0	24.4	7.8	7.9	7.67	7.85	243	-	-	-
		24.5 - 25.6	24.3 - 24.5	7.6 - 7.9	7.6 - 8.4	7.64 - 7.71	7.70 - 7.97	233 - 248	-	-	-
	72%	25.0	24.4	7.8	7.9	7.62	7.81	206	-	-	-
		24.5 - 25.6	24.3 - 24.5	7.6 - 7.9	7.6 - 8.5	7.56 - 7.69	7.67 - 7.93	199 - 215	-	-	-
<i>Ceriodaphnia dubia</i>	100%	25.0	24.4	7.8	7.9	7.56	7.79	166	57.0	63.3	<0.10
		24.5 - 25.6	24.3 - 24.5	7.6 - 8.0	7.6 - 8.4	7.43 - 7.66	7.65 - 7.91	164 - 169	57.1 - 58.1	62.6 - 67.0	<0.10 - <0.10
	Intake	25.0	24.4	7.9	7.9	7.55	7.77	164	57.8	63.3	<0.10
		24.5 - 25.6	24.3 - 24.5	7.8 - 8.0	7.6 - 8.3	7.47 - 7.67	7.66 - 7.84	161 - 168	57.1 - 58.1	62.6 - 64.6	<0.10 - <0.10

**PHYSICAL/CHEMICAL SUMMARY**

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, June 17-24, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L CaCO <sub>3</sub> )	Hardness (mg/L CaCO <sub>3</sub> )	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
<i>Pimephales promelas</i>	Control	25.3	24.6	7.8	7.5	7.72	7.61	296	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 8.0	7.1 - 7.8	7.61 - 7.77	7.53 - 7.72	285 - 306	-	-	-
	10.98%	25.3	24.6	7.8	7.4	7.73	7.56	289	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.5 - 8.0	7.0 - 7.6	7.63 - 7.77	7.47 - 7.68	279 - 300	-	-	-
	22%	25.3	24.6	7.8	7.4	7.73	7.55	276	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 8.0	6.9 - 7.7	7.61 - 7.77	7.44 - 7.68	266 - 284	-	-	-
	43.9%	25.2	24.6	7.8	7.3	7.71	7.53	242	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 8.0	6.9 - 7.6	7.59 - 7.77	7.43 - 7.68	234 - 249	-	-	-
	72%	25.2	24.6	7.8	7.3	7.68	7.50	206	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 7.9	6.7 - 7.6	7.57 - 7.75	7.42 - 7.65	200 - 216	-	-	-
	100%	25.2	24.6	7.8	7.4	7.64	7.51	167	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 7.9	6.8 - 7.8	7.52 - 7.74	7.42 - 7.64	163 - 170	-	-	-
	Intake	25.3	24.6	7.8	7.3	7.61	7.49	163	-	-	-
		24.6 - 25.7	24.3 - 24.8	7.6 - 7.9	6.9 - 7.7	7.52 - 7.69	7.36 - 7.63	160 - 166	-	-	-

## **SUMMARY / CONCLUSIONS**

Outfall 101 samples collected June 17 - 24, 2003, showed no toxic effects to fathead minnows or daphnids. The resulting  $IC_{25}$  values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples, suggesting that pathogenic bacteria were not present.

## Appendix A

### ADDITIONAL TOXICITY TEST INFORMATION

#### SUMMARY OF METHODS

1. *Pimephales promelas*

Tests were conducted according to EPA-821-R-02-013 (October 2002) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 400-mL polypropylene beakers, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

Tests were conducted according to EPA-821-R-02-013 (October 2002) using ten replicates, each containing one test organism, per treatment. Test vessels consisted of 30-mL polypropylene cups, each containing 15-mL of test solution.

#### DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

None

2. *Ceriodaphnia dubia*

None

#### DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

None

2. *Ceriodaphnia dubia*

None

## **PHYSICAL AND CHEMICAL METHODS**

1. Regents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).
2. Instruments: All identification, service, and calibration information pertaining to laboratory instruments is recorded in calibration and maintenance logbooks.
3. Temperature was measured using EPA Method 170.1.
4. Dissolved oxygen was measured using EPA Method 360.1.
5. The pH was measured EPA Method 150.1.
6. Conductance was measured EPA Method 120.1.
7. Alkalinity was measured using EPA Method 310.1.
8. Total Hardness was measured EPA Method 130.2.
9. Total residual chlorine was measured using EPA Method 330.5.

## **QUALITY ASSURANCE**

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage, glassware preparation, test organism culturing/acquisition and acclimation, test organism handling during test, and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA-821-R-02-013. Any known deviations were noted during the study and are reported herein.

## **REFERENCE TOXICANT TESTS** (See Appendix D for control chart information)

1. Test Type: 7-day chronic tests with results expressed as IC<sub>25</sub> values in g KCl or NaCl.
2. Standard Toxicant: Potassium Chloride (KCl crystalline) for *Pimephales promelas*.  
Sodium Chloride (NaCl crystalline) for *Ceriodaphnia dubia*.
3. Dilution Water Used: Moderately hard synthetic water.
4. Statistics: ToxCalc software Version 5.0 was used for statistical analyses.

## REFERENCES

1. NPDES Permit No. TN 0026450
2. USEPA. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013 (October 2002).
3. Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79/020 (March 1983).

**Sequoyah Nuclear Plant Biomonitoring  
June 17 - 24, 2003**

**Appendix B**

**Diffuser Discharge Concentrations of Total Residual Chlorine,  
Diffuser Discharge Concentrations of Chemicals Used to Control Growth  
of Microbiologically Induced Bacteria and Asiatic Clams,  
During Toxicity Test Sampling,**

**Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of  
Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams,  
During Toxicity Test Sampling,  
March 12, 1998-June 20, 2003**

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PGE-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat- PF mg/L Azole	H-150M mg/L Quat
03/12/1998	0.016	-	-	-	-	-	-
03/13/1998	0.015	-	-	-	-	-	-
03/14/1998	0.013	-	-	-	-	-	-
03/15/1998	0.030	-	-	-	-	-	-
03/16/1998	0.013	-	-	-	-	-	-
03/17/1998	0.020	-	-	-	-	-	-
03/18/1998	0.018	-	-	-	-	-	-
09/08/1998	0.015	-	0.014	0.005	-	-	0.021
09/09/1998	0.003	-	0.031	0.011	-	-	-
09/10/1998	0.014	-	0.060	0.021	-	-	-
09/11/1998	0.013	-	0.055	0.019	-	-	-
09/12/1998	<0.001	-	0.044	0.015	-	-	-
09/13/1998	<0.001	-	0.044	0.015	-	-	-
09/14/1998	0.008	-	0.044	0.015	-	-	-
02/22/1999	<0.001	-	-	-	-	-	-
02/23/1999	0.005	-	-	-	-	-	-
02/24/1999	0.009	-	-	-	-	-	-
02/25/1999	0.012	-	-	-	-	-	-
02/26/1999	0.008	-	-	-	-	-	-
02/27/1999	<0.001	-	-	-	-	-	-
02/28/1999	<0.001	-	-	-	-	-	-
08/18/1999	-	0.015	0.069	0.024	0.006	-	-
08/19/1999	-	0.012	0.068	0.024	-	-	-
08/20/1999	-	0.023	0.070	0.024	-	0.120	-
08/21/1999	-	0.022	0.068	0.024	-	-	-
08/22/1999	-	0.022	0.068	0.024	-	-	-
08/23/1999	-	0.025	0.068	0.024	0.006	-	-
08/24/1999	-	0.016	0.067	0.023	0.020	-	-



Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PGL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CE-363 mg/L DMAD	Cuprostat- PF mg/L Azole	H-130M mg/L Quat
01/31/2000	-	< 0.002	0.026	0.009	-	-	-
02/01/2000	-	0.011	0.026	0.028	-	-	-
02/02/2000	-	0.028	0.026	0.009	0.006	-	-
02/03/2000	-	0.008	0.027	0.009	-	-	-
02/04/2000	-	0.006	0.027	0.009	0.005	0.109	-
02/05/2000	-	< 0.002	0.027	0.009	-	-	-
02/06/2000	-	< 0.002	0.027	0.009	-	-	-
07/26/2000	-	< 0.0057	0.055	0.019	-	-	-
07/27/2000	-	0.019	0.055	0.019	-	-	-
07/28/2000	-	0.0088	0.053	0.018	0.004	0.108	-
07/29/2000	-	< 0.0088	0.055	0.019	-	-	-
07/30/2000	-	< 0.0076	0.055	0.019	-	-	-
07/31/2000	-	< 0.0152	0.055	0.019	0.006	-	-
08/01/2000	-	< 0.0141	0.055	0.019	0.005	-	-
12/11/2000	-	0.0143	0.025	0.020	0.005	-	-
12/12/2000	-	0.0092	0.025	0.020	0.005	-	-
12/13/2000	-	< 0.0120	0.025	0.020	-	-	-
12/14/2000	-	< 0.0087	0.025	0.020	-	-	-
12/15/2000	-	0.0120	0.025	0.020	0.005	-	-
12/16/2000	-	< 0.0036	0.025	0.020	-	-	-
12/17/2000	-	< 0.0036	0.025	0.020	-	-	-
08/26/2001	-	0.017	0.06	0.021	0.006	-	-
08/27/2001	-	< 0.0096	0.06	0.021	0.005	-	0.021
08/28/2001	-	< 0.0085	0.06	0.021	-	-	-
08/29/2001	-	< 0.0094	0.059	0.020	0.005	-	0.021
08/30/2001	-	< 0.0123	0.06	0.021	0.005	-	-
08/31/2001	-	< 0.005	0.059	0.020	-	-	-
11/25/2001	-	< 0.0044	-	-	-	-	-
11/26/2001	-	< 0.0119	0.024	0.02	0.005	-	-
11/27/2001	-	0.0137	0.023	0.019	0.007	-	-
11/28/2001	-	< 0.0089	0.022	0.019	0.006	-	-
11/29/2001	-	0.0132	0.024	0.02	0.007	-	-
11/30/2001	-	< 0.0043	0.024	0.02	-	-	-
12/09/2001	-	< 0.0042	-	-	-	-	-
12/10/2001	-	< 0.0042	-	-	-	-	-
12/11/2001	-	< 0.0104	-	-	-	-	-
12/12/2001	-	0.0128	0.024	0.02	0.008	-	-
12/13/2001	-	< 0.0088	0.024	0.02	-	-	-
12/14/2001	-	0.0134	0.024	0.02	0.007	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L EMAD	Cuprostat- PF mg/L Azole	H-130M mg/L Quat
01/02/2002	-	< 0.0079	0.023	0.02	0.006	-	-
01/03/2002	-	< 0.0042	0.023	0.014	-	-	-
01/04/2002	-	0.0124	0.024	0.014	0.009	-	-
01/05/2002	-	< 0.0042	-	-	-	-	-
01/06/2002	-	< 0.0042	-	-	-	-	-
01/07/2002	-	< 0.0089	0.024	0.014	0.006	-	-
02/24/2002	-	< 0.004	-	-	-	-	-
02/25/2002	-	< 0.004	0.023	0.023	-	-	-
02/26/2002	-	0.0143	0.023	0.023	0.007	-	-
02/27/2002	-	< 0.0041	0.023	0.023	-	-	-
02/28/2002	-	< 0.0041	0.024	0.008	-	-	-
03/01/2002	-	< 0.0041	0.024	0.008	-	-	-
05/05/2002	-	-	-	-	-	-	-
05/06/2002	-	-	0.058	0.02	0.014	-	-
05/07/2002	-	-	0.058	0.02	0.015	-	-
05/08/2002	-	-	0.056	0.019	-	-	-
05/09/2002	-	-	0.057	0.02	0.014	-	-
05/10/2002	-	-	0.056	0.019	-	-	-
08/04/2002	-	< 0.0058	-	-	-	-	-
08/05/2002	-	< 0.0058	0.053	0.018	-	-	0.025
08/06/2002	-	0.0092	0.053	0.018	-	-	-
08/07/2002	-	< 0.0107	0.055	0.019	0.007	-	-
08/08/2002	-	< 0.0061	0.055	0.019	-	-	-
08/09/2002	-	0.0152	0.054	0.018	0.008	-	-
10/06/2002	-	< 0.00497	-	-	-	-	-
10/07/2002	-	0.0153	0.054	0.018	0.009	-	-
10/08/2002	-	< 0.0092	0.054	0.018	0.007	-	-
10/09/2002	-	0.0124	0.053	0.018	0.009	-	-
10/10/2002	-	0.0134	0.054	0.018	0.009	-	-
10/11/2002	-	< 0.0042	0.054	0.018	-	-	-
01/12/2003	-	< 0.0035	-	-	-	-	-
01/13/2003	-	< 0.006	0.025	0.019	0.009	-	-
01/14/2003	-	< 0.0118	0.026	0.020	-	-	-
01/15/2003	-	< 0.0063	0.026	0.020	0.009	-	-
01/16/2003	-	< 0.0034	0.026	0.020	-	-	-
01/17/2003	-	< 0.0034	0.026	0.009	-	-	-
04/06/2003	-	< 0.0073	-	-	-	-	-
04/07/2003	-	< 0.0189	-	0.021	-	-	-
04/08/2003	-	< 0.0117	-	0.021	-	-	-
04/09/2003	-	< 0.0139	-	0.021	0.016	-	-
04/10/2003	-	< 0.0113	-	0.021	0.018	-	-
04/11/2003	-	< 0.0073	-	0.022	-	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-June 20, 2003

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
06/15/2003		< 0.0045		-		-	-
06/16/2003		< 0.0037	0.057	0.020		-	0.022
06/17/2003		< 0.0048	0.041	0.014		-	0.024
06/18/2003		< 0.0048	0.041	0.014		-	0.024
06/19/2003		< 0.0085	0.058	0.020		-	0.025
06/20/2003		< 0.0048	0.058	0.020		-	0.025

**Sequoyah Nuclear Plant Biomonitoring**  
**June 17 - 24, 2003**

**Appendix C**

**Chain of Custody Records and**  
**Toxicity Test Bench Sheets**

## BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1Client: TENNESSEE VALLEY AUTHORITYProject Name: SEQUOYAH NUCLEAR PLANTP.O. Number: PO BOX 2000Facility Sampled: SEQUOYAH NUCLEAR PLANTNPDES Number: TN 0026450Collected By: WANDA K ALLENENVIRONMENTAL TESTING  
SOLUTIONS351 DEPOT STREET  
ASHVILLE, NC 28801

PHONE: 828-350-9364

FAX: 256-386-2963

EMAIL: CLRUSSEL2@TVA.GOV(FedEx) UPS Bus Client CTI \$       Other (specify):                                 

General Comments:

*Custody seals intact, samples  
received in good condition.  
Hummel*

Field Identification / Sample Description	Grab/ Comp.	Shp. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD )	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	CTI Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DSN-101-TOX	<del>GRAB</del> Comp	4	6/15/03 1257 1257 1257	6/16/03 1257 1157 1157	(2) 2.5 GAL				✓		030617-01	0.4°C	J	0946	✓ See Comments
SQN-INT-TOX	<del>Comp</del> GRAB	4	6/15/03 1135	6/16/03 1235	(1) 2.5 GAL				✓		030617-02	0.4°C	J	0946	✓

## Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	6/16/03 1400	Fedex	06-16-03 1400
Fedex	06-17-03 0946	<i>Hummel</i>	06-17-03 0946

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

## BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1Client: TENNESSEE VALLEY AUTHORITYProject Name: SEQUOYAH NUCLEAR PLANTP.O. Number: PO BOX 2000Facility Sampled: SEQUOYAH NUCLEAR PLANTNPDES Number: TN 0026450Collected By: WANDA K ALLENENVIRONMENTAL TESTING  
SOLUTIONS351 DEPOT STREET  
ASHVILLE, NC 28801

PHONE: 828-350-9364

FAX: 256-386-2963

EMAIL: CLRUSSEL2@TVA.GOV

FedEx UPS Bus Client CTI \$

Other (specify):

General Comments:

*Custody seals intact. Samples  
received in ~~all~~ good condition.  
Jumma*

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD )	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	CTI Log Number	Arrival Temp. (°C)	By	Time	Appear- ance
SQN-DSN-101-TOX	GRAB Comp	4	6/17/03 1402 1402	6/18/03 1302 1302	(2) 2.5 GAL		✓				0306A.01	0.4°C	Jl	0939	See Comments ↓
SQN-INT-TOX	Comp GRAB	4	6/17/03 1349	6/18/03 1248	(1) 2.5 8.0 GAL		✓				0306A.02	0.4°C	Jl	0939	↓

## Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	6/18/03 1500	<i>Fedex</i>	06-18-03 1500
<i>Fedex</i>	06-19-03 0939	<i>Helkeeman ETS</i>	06-19-03 0939

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

## BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: TENNESSEE VALLEY AUTHORITY

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN 0028450

Collected By: WANDA K ALLEN

ENVIRONMENTAL TESTING  
SOLUTIONS

351 DEPOT STREET  
ASHVILLE, NC 28801

PHONE: 828-350-9364  
FAX: 256-386-2963  
EMAIL: CLRUSSEL2@TVA.GOV

FedEx UPS Bus Client CTI \$        
Other (specify):                                 

## General Comments:

*+ Custody seals intact. Samples  
received in good condition.*  
*J. Sumner*

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD )	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	CTI Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DSN-101-TOX	GRAB Comp	4	6/19/03 1256 1256	6/20/03 1156 1156	(2) 2.5 GAL		✓				030621-06	09°C	J	1004	See Comments
SQN-INT-TOX	Comp GRAB	4	6/19/03 1233	6/20/03 1133	(1) 2.5 1.0 GAL		✓				030621-07	21°C	J	1004	✓

## Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	6/20/03 1500	<i>Fedex</i>	06-20-03 1500
<i>Fedex</i>	06-21-03 1004	<i>J. Sumner</i>	06-21-03 1004

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013 Method 1000.0)

Species: *Pimephales promelas*

Client: TYA  
 Facility: SEQUOYAH NUCLEAR PLANT  
 NPDES #: TN-0026450  
 Project #: 744  
NONTREATED

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	219.6	440	878	1440	2000	
Diluent volume (mL)	1780.4	1560	1122	560	0	
Total volume (mL)	2000	2000	2000	2000	2000	

Test organism information: 23.5-25.5 cm		Test information:	
Organism age:	24.5-29.5 - hours old	Randomizing template:	Blue
Date and times organisms were born between:	06-16-03 1100 TO 1300 MDT	Incubator number:	3
Organism source:	ABS BATCH 06-16-03	Artemia lot number:	B604030
Transfer bowl information:	pH = 8.00 Temperature = 24.7 °C	Total drying time:	19hr
Average transfer volume:	10.4 mL	Date / Time in:	06-24-03 1530
		Date / Time out:	06-25-03 1030
		Oven temperature:	103°C

## Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	06-17-03	—	1500	1422	06-17-03	030617.01/.02	dl
1	06-18-03	0900	1500	1330	06-17-03	030617.01/.02	dl
2	06-19-03	0900	1500	1336	06-17-03	030619.01/.02	dl
3	06-20-03	1030	1635	1400	06-17-03	030619.01/.02	dl
4	06-21-03	0900	1500	1340	06-17-03	030621.06/.07	dl
5	06-22-03	0913	1520	1342	06-21-03	030621.06/.07	dl
6	06-23-03	0852	1500	1338	06-21-03	030621.06/.07	dl
7	06-24-03			1440			dl

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC <sub>50</sub>	> 100%
Average weight per initial larvae:	0.8352		NOEC	100%
Average weight per surviving larvae:	0.8352	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC <sub>25</sub>	> 100%



Species: *Pimephales promelas*Client: TVA - Sequoyah  
NONTREATEDDate: 06-17-03

## Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	9 <sup>id</sup>	10	10	10	10
3	10	10	10	10	10	10	10	9	10	10	10	10
4	10	10	10	10	10	10	10	9	10	10	10	10
5	10	10	10	10	10	10	10	9	10	10	10	10
6	10	10	10	10	10	10	10	9	10	10	10	10
7	10	10	10	10	10	10	10	9	10	10	10	10
A = Pan weight (mg)	14.345	14.658	14.933	15.045	15.069	14.905	15.039	15.049	15.249	14.861	14.945	14.935
B = Pan + Larvae weight (mg)	23.60	22.44	22.56	22.19	23.06	21.95	22.15	23.38	21.95	22.92	23.57	24.57
Larvae weight (mg) = A - B	8.885	8.782	10.762	9.945	8.791	7.305	7.111	8.035	9.701	8.059	8.625	9.595

8.885 8.782 10.762 9.945 8.791 7.305 7.111 8.035 9.701 8.059 8.625 9.595  
 Calculations and data reviewed: *[Signature]*

Comments:

Species: *Pimephales promelas*Client: TVA - SequoyahNONTREATEDDate: 06-17-03

## Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg)	15.019	14.760	14.692	14.833	15.266	15.053	14.842	15.396	14.646	14.735	14.417	15.113
B = Pan + Larvae weight (mg)	24.43	24.40	24.34	24.51	24.17	24.30	24.26	25.67	24.09	23.88	24.22	23.27
Larvae weight (mg) = A - B	0.9411	0.9440	0.9443	0.9677	0.8904	0.9247	0.9418	1.0274	0.9444	0.9145	0.9523	0.8157

0.9411  
 0.9440  
 0.9443  
 0.9677  
 0.8904  
 0.9247  
 0.9418  
 1.0274  
 0.9444  
 0.9145  
 0.9523  
 0.8157

Calculations and data reviewed.

← for  
 INITIAL  
 LARVAE

Comments:

Species: *Pimephales promelas*Client: TVA - SEQUOYAHDate: 06-17-03

NONTREATED

## Survival and Growth Data

Day	100% - INTAKE			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	9 <sup>id</sup>	10
5	10	10	9	10
6	10	10	9	10
7	10	10	9	10
A = Pan weight (mg)	14.64	14.63	14.861	15.032
B = Pan + Larvae weight (mg)	23.07	23.92	22.86	24.23
Larvae weight (mg) = A - B	8.434	9.227	7.974	9.943

→ 8.434 9.227 7.974 9.943

← PER INITIAL LARVAE

Calculations and data reviewed: *df*

Comments:

# Environmental Testing Solutions, LLC

## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)

Species: *Pimephales promelas*

### Quality Control

### Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant, Nontreated

Test dates: June 17-24, 2003

Project number: 744

Reviewed by: *Jumner*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A - Pan weight (mg)	B - Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.745	23.600	8.855	0.8855	100.0	0.8352	9.1	Not applicable
	B	10	10	14.658	22.440	7.782	0.7782				
	C	10	10	14.933	22.560	7.627	0.7627				
	D	10	10	15.045	24.190	9.145	0.9145				
10.98%	E	10	10	15.069	23.060	7.991	0.7991	97.5	0.7705	7.2	7.8
	F	10	10	14.565	21.950	7.385	0.7385				
	G	10	10	15.039	22.150	7.111	0.7111				
	H	10	9	15.049	23.380	8.331	0.8331				
22%	I	10	10	15.249	24.950	9.701	0.9701	100.0	0.8995	8.8	-7.7
	J	10	10	14.861	22.920	8.059	0.8059				
	K	10	10	14.945	23.570	8.625	0.8625				
	L	10	10	14.975	24.570	9.595	0.9595				
43.9%	M	10	10	15.019	24.430	9.411	0.9411	100.0	0.9593	1.3	-14.9
	N	10	10	14.760	24.400	9.640	0.9640				
	O	10	10	14.697	24.340	9.643	0.9643				
	P	10	10	14.833	24.510	9.677	0.9677				
72%	Q	10	10	15.266	24.170	8.904	0.8904	100.0	0.9461	6.2	-13.3
	R	10	10	15.053	24.300	9.247	0.9247				
	S	10	10	14.842	24.260	9.418	0.9418				
	T	10	10	15.396	25.670	10.274	1.0274				
100%	U	10	10	14.646	24.090	9.444	0.9444	100.0	0.9067	6.9	-8.6
	V	10	10	14.735	23.880	9.145	0.9145				
	W	10	10	14.697	24.220	9.523	0.9523				
	X	10	10	15.113	23.270	8.157	0.8157				
100% Intake	U	10	10	14.636	23.070	8.434	0.8434	97.5	0.8708	7.0	-4.3
	V	10	10	14.693	23.920	9.227	0.9227				
	W	10	9	14.881	22.860	7.979	0.7979				
	X	10	10	15.037	24.230	9.193	0.9193				

#### Outfall 101:

Dunnett's MSD value: 0.1046  
PMSD: 12.5

MSD =  
PMSD =

Minimum Significant Difference  
Percent Minimum Significant Difference

#### Intake:

Dunnett's MSD value: 0.0946  
PMSD: 11.3

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing). Lower PMSD bound determined by USEPA (10th percentile) = 9.4%. Upper PMSD bound determined by USEPA (90th percentile) = 35%. The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

# Environmental Testing Solutions, LLC

## Statistical Analyses

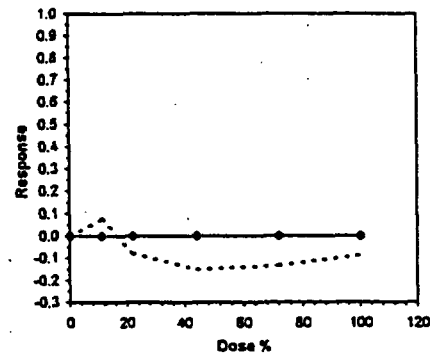
Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 6/17/03	Test ID: PpFRCR	Sample ID: Sequoyah Nuclear Plant, Outfall 101		
End Date: 6/24/03	Lab ID: ETS-Env. Testing Solutions	Sample Type: DMR-Discharge Monitoring Report		
Sample Date:	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species: PP-Pimephales promelas		

Conc-%	1	2	3	4
D-Control	0.8833	0.7782	0.7627	0.9145
10.98	0.7991	0.7383	0.7111	0.8331
22	0.9701	0.8039	0.8623	0.9393
43.9	0.9411	0.9640	0.9643	0.9677
72	0.8904	0.9247	0.9418	1.0274
100	0.9444	0.9145	0.9323	0.8137

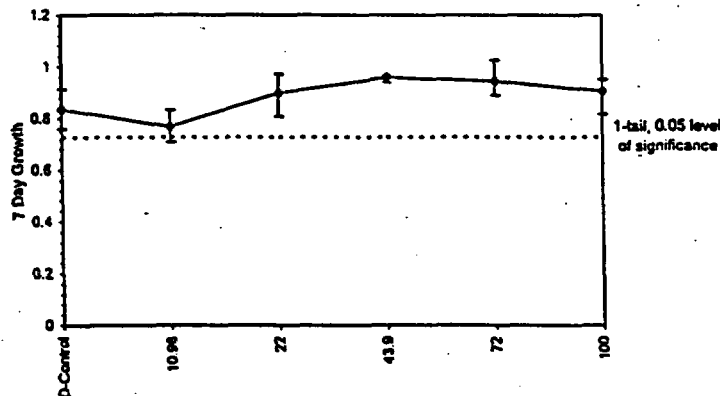
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	I-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8352	1.0000	0.8352	0.7627	0.9145	9.098	4				0.8862	1.0000
10.98	0.7703	0.9224	0.7703	0.7111	0.8331	7.222	4	1.493	2.410	0.1046	0.8862	1.0000
22	0.8993	1.0770	0.8993	0.8039	0.9701	8.781	4	-1.481	2.410	0.1046	0.8862	1.0000
43.9	0.9393	1.1483	0.9393	0.9411	0.9677	1.275	4	-2.858	2.410	0.1046	0.8862	1.0000
72	0.9461	1.1327	0.9461	0.8904	1.0274	6.160	4	-2.554	2.410	0.1046	0.8862	1.0000
100	0.9067	1.0856	0.9067	0.8137	0.9323	6.929	4	-1.647	2.410	0.1046	0.8862	1.0000

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )					0.932284813	0.884	-0.13984902	-1.10445676			
Bartlett's Test indicates equal variances ( $p = 0.24$ )					6.764860153	15.08631706					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	0.104393279	0.125227668	0.02041572	0.003767068	0.003256632	5, 18
Treatments vs D-Control											

Linear Interpolation (100 Resamples)				
Petal	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



# Environmental Testing Solutions, LLC

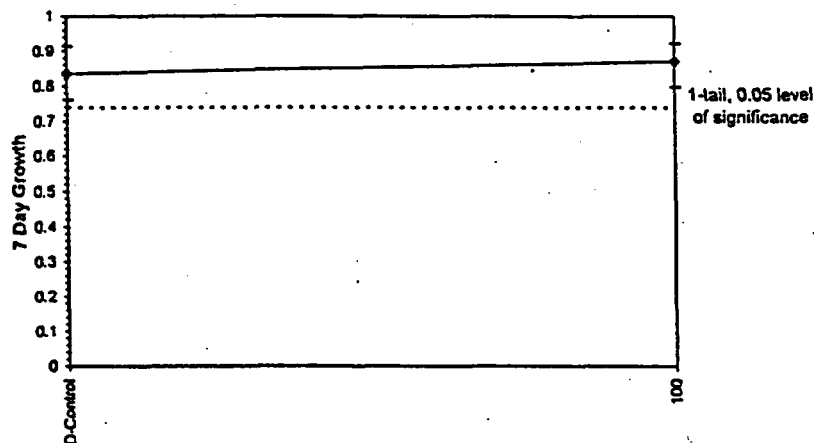
## Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth				
Start Date: 6/17/03	Test ID: PpFRCR	Sample ID:	Sequoyah Nuclear Plant, Intake	
End Date: 6/24/03	Lab ID: ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report	
Sample Date:	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species:	PP-Pimephales promelas	
Comments:				
Conc.-%	1	2	3	4
D-Control	0.8855	0.7782	0.7627	0.9145
100	0.8434	0.9227	0.7979	0.9193

Conc.-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	I-Tailed Critical	MSD
			Mean	Min	Max	CV%				
D-Control	0.8352	1.0000	0.8352	0.7627	0.9145	9.098	4			
100	0.8708	1.0426	0.8708	0.7979	0.9227	6.989	4	-0.731	1.943	0.0946

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.83873248	0.749	-0.07104958	-2.28744906
F-Test indicates equal variances ( $p = 0.72$ )	1.55915618	47.4683436		
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE
Homoscedastic t Test indicates no significant differences	0.09459063	0.11325168	0.00253472	0.00473914
Treatments vs D-Control			0.49213776	1, 6

Dose-Response Plot



**Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013 Method 1002.0)**  
**Species: *Ceriodaphnia dubia***

Client: TVA  
 Facility: SEQUOIA NUCLEAR PLANT  
 NPDES #: TN-0026450  
 Project #: \_\_\_\_\_ - NONTREATED

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	219.6	440	878	1440	2000	
Diluent volume (mL)	1780.4	1560	1122	560	0	
Total volume (mL)	2000	2000	2000	2000	2000	

Test organism information:		Test information:	
Organism age:	< 24-HOURS OLD	Randomizing template:	Blue
Date and times organisms were born between:	06-17-03 0752 TO 1126	Incubator number and shelf location:	2
Organism source:	06-10-03 A-D	YCT batch:	ABS 05-23-02
Transfer bowl information:	pH = 8.00 Temperature = 24.9	Selenastrum batch:	ABS 05-23-03

**Daily renewal information:**

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	06-17-03	1314	06-17-03 MHS	030617.01/.02	dl
1	06-18-03	1228	06-17-03	030617.01/.02	dl
2	06-19-03	1233	06-17-03	030618.01/.02	dl
3	06-20-03	1302	06-17-03	030619.01/.02	dl
4	06-21-03	1225	06-17-03	030621.06/.07	dl
5	06-22-03	1238	06-21-03	030621.06/.07	dl
6	06-23-03	1220	06-21-03	030621.06/.07	dl
7	06-24-03	1300			dl

Control information:		Acceptance criteria	Summary of test endpoints:	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 100%
% Adults having 3 <sup>rd</sup> Broods:	100%	≥ 80%	NOEC	100%
% Mortality:	0%	≤ 20%	LOEC	> 100%
Mean Offspring/Female:	27.6	≥ 15.0 offspring/female	ChV	> 100%
% CV:	9.2%	< 40.0 %	IC25	> 100%

Species: *Ceriodaphnia dubia*Client: TVA-SEQUOIAHDate: 06-17-03**CONTROL****Survival and Reproduction Data**

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	4	3	3	3	4	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	0	0	0	0	10	0	11	9	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	10	8	10	12	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	16	12	14	13	16	12	14	12	16
Total young produced		30	30	23	21	28	30	26	29	24	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3 <sup>rd</sup> Broods		X	X	X	X	X	X	X	X	X	X

Concentration:

% Mortality:

0%

Mean Offspring/Female:

27.6

CONCENTRATION: 10.98%**Survival and Reproduction Data**

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	4	3	3	5	4	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	11	0	11	0	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	9	11	9	10	0	10	0	11	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	12	16	14	17	17	13	15	18
Total young produced		27	29	24	30	28	30	33	28	31	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:

0%

Mean Offspring/Female:

29.1

% Reduction from Control:

-5.4%



Species: *Ceriodaphnia dubia*Client: TVA-SEQUOIANDate: 06-17-03CONCENTRATION: 22%*Survival and Reproduction Data*

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	3	4	4	4	3	5	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	13	0	14	0	10	0	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	11	12	0	10	0	11	0	13	0	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	14	17	16	19	13	14	14	17	14
Total young produced		31	30	34	29	37	28	28	30	32	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:

0%

Mean Offspring/Female:

30.7

% Reduction from Control:

-11.2%

CONCENTRATION: 43.9%*Survival and Reproduction Data*

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	3	4	6	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	12	0	0	12	10	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	12	10	11	0	13	11	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	19	15	17	17	16	16	17	13	20	19
Total young produced		35	31	34	31	32	35	32	29	33	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:

0%

Mean Offspring/Female:

32.8

% Reduction from Control:

-18.8%

Species: *Ceriodaphnia dubia*Client: TVA-SEQUOIAHDate: 06-17-03CONCENTRATION: 12%

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	5	4	4	3	4	4	3	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	14	11	12	0	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	10	12	11	0	0	0	10	0	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	15	18	15	18	17	17	19	17	20
Total young produced		34	29	35	30	36	31	33	33	30	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	32.7
% Reduction from Control:	-18.5%

CONCENTRATION: 100%

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	4	3	5	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	13	12	0	13	11	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	13	11	15	0	0	13	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	17	17	14	19	19	18	20	15	17
Total young produced		37	34	32	33	35	36	35	37	31	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	34.5
% Reduction from Control:	-25.0%

Species: *Ceriodaphnia dubia*Client: TVA-SEQUOYAHDate: 06-17-03CONCENTRATION: 100% - INTAKE*Survival and Reproduction Data*

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	4	4	4	4	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	0	0	0	11	0	0	0	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	12	12	11	0	9	12	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	18	15	14	15	16	12	15	17
Total young produced		28	29	33	31	29	30	29	27	29	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.8
% Reduction from Control:	-2.4%

**Environmental Testing Solutions, LLC**  
**Verification of *Ceriodaphnia* Reproduction Totals**

**Control**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	4	3	3	3	4	4	4	3	4	35
5	9	0	0	0	0	10	0	11	9	9	48
6	0	10	8	10	12	0	10	0	0	0	50
7	18	16	12	14	13	16	12	14	12	16	143
Total	30	30	23	27	28	30	26	29	24	29	276

**43.9%**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	3	4	6	4	4	3	4	40
5	0	0	0	0	12	0	0	12	10	13	47
6	12	12	13	11	0	13	11	0	0	0	72
7	19	15	17	17	16	16	17	13	20	19	169
Total	35	31	34	31	32	35	32	29	33	36	328

**10.98%**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	3	3	5	4	3	3	36
5	0	0	0	0	11	0	11	0	13	10	45
6	9	11	9	10	0	10	0	11	0	0	60
7	14	14	12	16	14	17	17	13	15	18	150
Total	27	29	24	30	28	30	33	28	31	31	291

**72%**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	4	4	3	4	4	3	5	40
5	0	0	0	0	14	11	12	0	10	0	47
6	14	10	12	11	0	0	0	10	0	11	68
7	16	15	18	15	18	17	17	19	17	20	172
Total	34	29	35	30	36	31	33	33	30	36	327

**22%**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	3	4	4	4	3	5	3	39
5	0	0	13	0	14	0	10	0	10	0	47
6	11	12	0	10	0	11	0	13	0	11	68
7	15	14	17	16	19	13	14	14	17	14	153
Total	31	30	34	29	37	28	28	30	32	28	307

**100%**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	3	5	4	4	5	4	42
5	0	0	0	0	13	12	0	13	11	14	63
6	14	13	11	15	0	0	13	0	0	0	66
7	18	17	17	14	19	19	18	20	15	17	174
Total	37	34	32	33	35	36	35	37	31	35	345

**100% Intake**

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	4	4	4	3	4	4	38
5	10	11	0	0	0	11	0	0	0	12	44
6	0	0	12	12	11	0	9	12	10	0	66
7	14	14	18	15	14	15	16	12	15	17	150
Total	28	29	33	31	29	30	29	27	29	33	298

# Environmental Testing Solutions, LLC

## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)

Species: *Ceriodaphnia dubia*

### Quality Control

### Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant, Nontreated  
 Test dates: June 17-24, 2003  
 Project number: 744

Reviewed by: *Jumra*

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	30	30	23	27	28	30	26	29	24	29	100	27.6	9.2	Not applicable
10.98%	27	29	24	30	28	30	33	28	31	31	100	29.1	8.6	-5.4
22%	31	30	34	29	37	28	28	30	32	28	100	30.7	9.6	-11.2
43.9%	35	31	34	31	32	35	32	29	33	36	100	32.8	6.7	-18.8
72%	34	29	35	30	36	31	33	33	30	36	100	32.7	7.9	-18.5
100%	37	34	32	33	35	36	35	37	31	35	100	34.5	5.8	-25.0
100% Intake	28	29	33	31	29	30	29	27	29	33	100	29.8	6.7	-2.4

#### Outfall 112:

Dunnett's MSD value: 2.515 2.542  
 PMSD: 9.1 9.1

#### Intake:

Dunnett's MSD value: 1.772  
 PMSD: 6.4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.9% from the control.

Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 11%.

Upper PMSD bound determined by USEPA (90<sup>th</sup> percentile) = 37%.

The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

# Environmental Testing Solutions, LLC

## Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction				
Start Date: June 17, 2003	Test ID: C4FRCR	Sample ID:	Sequoyah Nuclear Plant, Outfall 101	
End Date: June 24, 2003	Lab ID: ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report	
Sample Date	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species:	CD-Ceriodaphnia dubia	
Comments:				

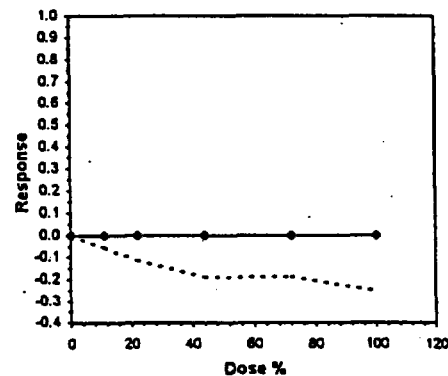
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	30.000	23.000	27.000	28.000	30.000	26.000	29.000	24.000	29.000
10.98	27.000	29.000	24.000	30.000	28.000	30.000	33.000	28.000	31.000	31.000
22	31.000	30.000	34.000	29.000	37.000	28.000	28.000	30.000	32.000	28.000
43.9	35.000	31.000	34.000	31.000	32.000	35.000	32.000	29.000	33.000	36.000
72	34.000	29.000	35.000	30.000	36.000	31.000	33.000	33.000	30.000	36.000
100	37.000	34.000	32.000	33.000	35.000	36.000	35.000	37.000	31.000	35.000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	27.600	1.0000	27.600	23.000	30.000	9.229	10				31.233	1.0000
10.98	29.100	1.0543	29.100	24.000	33.000	8.641	10	-1.349	2.287	2.542	31.233	1.0000
22	30.700	1.1123	30.700	28.000	37.000	9.595	10	-2.789	2.287	2.542	31.233	1.0000
43.9	32.800	1.1884	32.800	29.000	36.000	6.710	10	-4.678	2.287	2.542	31.233	1.0000
72	32.700	1.1848	32.700	29.000	36.000	7.903	10	-4.588	2.287	2.542	31.233	1.0000
100	34.500	1.2500	34.500	31.000	37.000	5.837	10	-6.208	2.287	2.542	31.233	1.0000

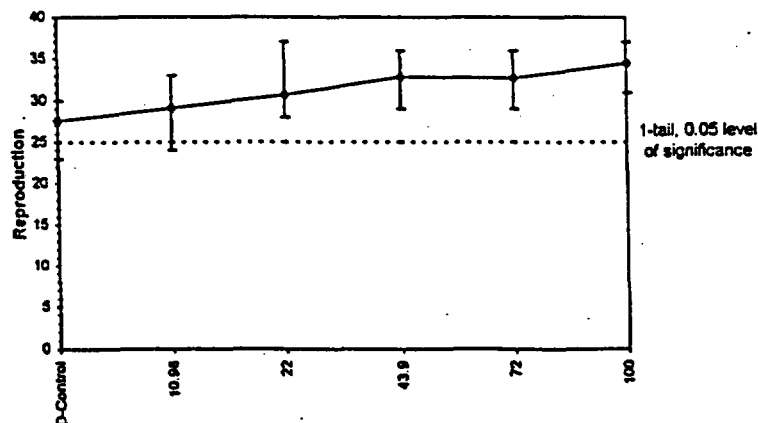
Auxiliary Tests					Statistic		Critical		Skew		Kurt			
Kolmogorov D Test indicates normal distribution (p > 0.01)					0.52460682		1.035		0.00625967		-0.350923			
Bartlett's Test indicates equal variances (p = 0.91)					1.50215983		15.0863171							
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSD <sub>u</sub>	MSD <sub>p</sub>	MSB	MSE	F-Prob	df
Dunnnett's Test					100	>100		1	2.54175679	0.09209264	66.6266667	6.17777778	3.2E-07	5, 54
Treatments vs D-Control														

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



# Environmental Testing Solutions, LLC

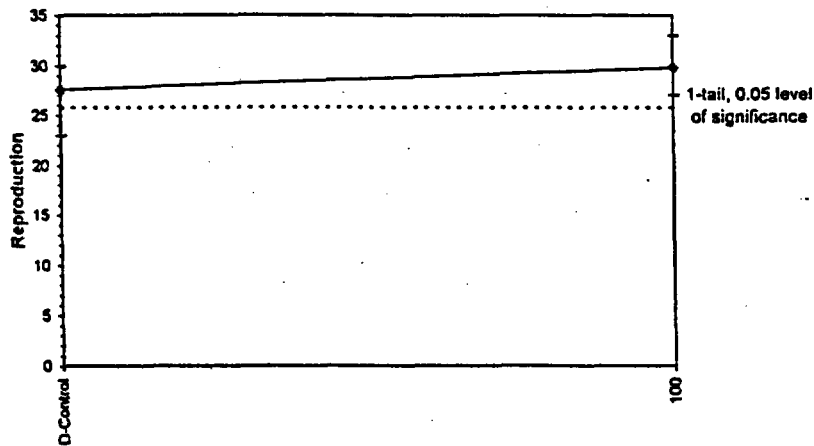
## Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction										
Start Date:	June 17, 2003	Test ID:	CdFRCR	Sample ID:	Sequoyah Nuclear Plant, Intake					
End Date:	June 24, 2003	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report					
Sample Date:		Protocol:	CHRONIC (EPA-821-R-02-013)	Test Species:	CD-Ceriodaphnia dubia					
Comments:										
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	30.000	23.000	27.000	28.000	30.000	26.000	29.000	24.000	29.000
100	28.000	29.000	33.000	31.000	29.000	30.000	29.000	27.000	29.000	33.000

Transform: Untransformed										
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	1-Tailed Critical	MSD
D-Control	27.600	1.0000	27.600	23.000	30.000	9.229	10			
100	29.800	1.0797	29.800	27.000	33.000	6.674	10	-2.153	1.734	1.772

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.95612454	0.868	-0.33926213	-0.54348982
F-Test indicates equal variances ( $p = 0.47$ )	1.6404494	6.54108572		
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE
Homoscedastic t Test indicates no significant differences	1.77217886	0.06420938	24.2	5.22222222
Treatments vs D-Control			F-Prob	df
			0.04515683	1, 18

Dose-Response Plot



## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013 Method 1000.0)

Species: *Pimephales promelas*

Client: TVA  
 Facility: SEQUOYA NUCLEAR PLANT  
 NPDES #: TN-0026450  
 Project #: 744  
UV-TREATED

Dilution preparation information:						Comments:
Dilution prep (%)	10.98	22	43.9	72	100	CACH CONCENTRATION WAS
Effluent volume (mL)	29.6	440	878	1440	2000	UV-TREATED FOR 2-MINUTES
Diluent volume (mL)	1780.4	1560	1122	560	0	WITH A 40 WATT
Total volume (mL)	2000	2000	2000	2000	2000	UV-STERILIZER

Test organism information:		Test information:	
Organism age:	27.5 - 29.5 - hours old	Randomizing template:	Yellow
Date and times organisms were born between:	06-16-03 1100 TO 1300 MDT	Incubator number:	3
Organism source:	ABS BATCH 06-16-03	Artemia lot number:	06-04030
Transfer bowl information:	pH = 8.00 Temperature = 21.7 °C	Total drying time:	19 hr
Average transfer volume:	10.4 mL	Date / Time in:	06-24-03 1530
		Date / Time out:	06-25-03 1030
		Oven temperature:	103 °C

## Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	06-17-03	0800	1500	1440	06-17-03 MHS	030617.01 / .02	JH
1	06-18-03	0900	1500	1352	06-17-03	030617.01 / .02	JH
2	06-19-03	0900	1500	1400	06-17-03	030619.01 / .02	JH
3	06-20-03	1030	1635	1421	06-17-03	030619.01 / .02	JH
4	06-21-03	0900	1500	1408	06-17-03	030621.06 / .07	JH
5	06-22-03	0913	1520	1409	06-21-03	030621.06 / .07	JH
6	06-23-03	0852	1500	1403	06-21-03	030621.06 / .07	JH
7	06-24-03			1505			JH

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	0%	≤ 20%	7-day LC <sub>50</sub>	> 100 %
Average weight per initial larvae:	0.8110		NOEC	100 %
Average weight per surviving larvae:	0.8110	≥ 0.25 mg/larvae	LOEC	> 100 %
			ChV	> 100 %
			IC <sub>25</sub>	> 100 %



Species: *Pimephales promelas*Client: TVA - SEQUOYAHDate: 06-17-03

UV-TREATED

## Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	9 <sup>1d</sup>	10	10	9 <sup>1d</sup>	10
3	10	10	10	10	10	10	10	9	10	10	9	10
4	10	10	10	10	10	10	10	9	10	10	9	10
5	10	10	10	10	10	10	10	9	10	10	9	10
6	10	10	10	10	10	10	10	9	10	10	9	10
7	10	10	10	10	10	10	10	9	10	10	9	10
A = Pan weight (mg)	15.15 <sup>2</sup>	15.08 <sup>5</sup>	15.078	15.031	14.635	15.005	14.842	14.655	14.788	14.920	14.550	15.008
B = Pan + Larvae weight (mg)	22.38	22.28	23.38	24.26	23.88	23.51	23.96	24.09	24.53	23.72	22.92	24.43
Larvae weight (mg) = A - B	0.7723	0.7065	0.8302	0.9224	0.895	0.8305	0.9118	0.9435	0.9742	0.8000	0.8370	0.5422

01 → 1.223 7.683 8.307 9.224 8.305 8.305 9.118 9.435 9.742 8.800 8.370 9.422

Calculations and data reviewed:

← Per INT'L  
LAWME

Comments:

Species: *Pimephales promelas*Client: TYA-SEQUOIA  
UV-TREATEDDate: 06-17-03

## Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	9 <sup>id</sup>	10	10	10	10
3	10	10	10	10	10	10	10	9	10	10	10	10
4	10	10	10	10	10	10	10	9	10	10	10	10
5	10	10	10	10	10	10	10	9	10	10	10	10
6	10	10	10	10	10	10	10	9	10	10	10	10
7	10	10	10	10	10	10	10	9	10	10	10	10
A = Pan weight (mg)	14.846	14.690	15.013	14.959	15.171	15.263	14.935	15.055	14.923	15.107	15.004	15.096
B = Pan + Larvae weight (mg)	23.02	23.22	24.46	23.94	24.26	25.71	25.06	24.76	24.99	24.49	23.86	22.55
Larvae weight (mg) = A - B	0.8224	0.8530	0.9447	0.8961	0.9094	1.0447	1.0085	0.9705	1.0017	0.9353	0.8856	0.7491

0.8224 0.8530 0.9447 0.8961 0.9094 1.0447 1.0085 0.9705 1.0017 0.9353 0.8856 0.7491  
 Calculations and data reviewed:

= Per  
 INITIAL  
 LARVAE

Comments:

Species: *Pimephales promelas*Client: TVA - SequoyahDate: 06-17-03

UV-TREATED

## Survival and Growth Data

Day	100% INTAKE			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg)	14.836	15.060	14.766	14.986
B = Pan + Larvae weight (mg)	23.44	24.22	24.01	25.47
Larvae weight (mg) = A - B	8.604	9.160	9.244	10.484

← Per INITIAL LARVAE

Calculations and data reviewed: *af*

Comments:

**Environmental Testing Solutions, LLC**  
**Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)**  
**Species: *Pimephales promelas***

**Quality Control**  
**Verification of Data Entry, Calculations, and Statistical Analyses**

Client: TVA Sequoyah Nuclear Plant, UV Treated  
 Test dates: June 17-24, 2003  
 Project number: 744

Reviewed by: *J. J. J.*

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = B - A	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15.157	22.380	7.223	0.7223	100.0	0.8110	10.7	Not applicable
	B	10	10	15.095	22.780	7.685	0.7685				
	C	10	10	15.078	23.380	8.302	0.8302				
	D	10	10	15.031	24.260	9.229	0.9229				
10.98%	E	10	10	14.685	23.080	8.395	0.8395	97.5	0.8813	6.3	-8.7
	F	10	10	15.005	23.310	8.305	0.8305				
	G	10	10	14.842	23.960	9.118	0.9118				
	H	10	9	14.655	24.090	9.435	0.9435				
22%	I	10	10	14.788	24.530	9.742	0.9742	97.5	0.9084	6.8	-12.0
	J	10	10	14.920	23.720	8.800	0.8800				
	K	10	9	14.550	22.920	8.370	0.8370				
	L	10	10	15.008	24.430	9.422	0.9422				
43.9%	M	10	10	14.846	23.070	8.224	0.8224	100.0	0.8796	6.1	-8.5
	N	10	10	14.690	23.220	8.530	0.8530				
	O	10	10	15.013	24.460	9.447	0.9447				
	P	10	10	14.959	23.940	8.981	0.8981				
72%	Q	10	10	15.171	24.260	9.089	0.9089	97.5	0.9832	5.9	-21.2
	R	10	10	15.263	25.710	10.447	1.0447				
	S	10	10	14.975	25.060	10.085	1.0085				
	T	10	9	15.055	24.760	9.705	0.9705				
100%	U	10	10	14.973	24.990	10.017	1.0017	100.0	0.8928	12.2	-10.1
	V	10	10	15.107	24.490	9.383	0.9383				
	W	10	10	15.004	23.860	8.856	0.8856				
	X	10	10	15.096	22.550	7.454	0.7454				
100% Intake	Y	10	10	14.836	23.440	8.604	0.8604	100.0	0.9373	8.5	-15.6
	Z	10	10	15.060	24.220	9.160	0.9160				
	AA	10	10	14.766	24.010	9.244	0.9244				
	BB	10	10	14.986	25.470	10.484	1.0484				

**Outfall 101:**  
 Dunnett's MSD value: 0.1254  
 PMSD: 15.5

**Intake:**  
 Dunnett's MSD value: 0.1142  
 PMSD: 14.1

MSD = Minimum Significant Difference  
 PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through Lower PMSD bound determined by USEPA (10th percentile) = 9.4%. Upper PMSD bound determined by USEPA (90th percentile) = 35%. The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

# Environmental Testing Solutions, LLC

## Statistical Analyses

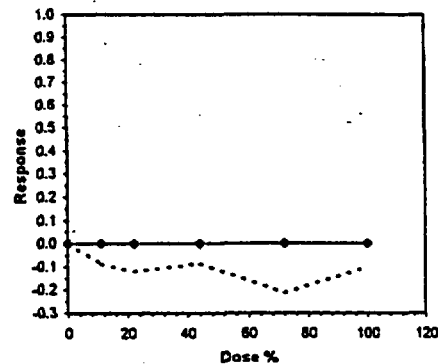
Larval Fish Growth and Survival Test-7 Day Growth			
Start Date: 6/17/03	Test ID: PpFRCR	Sample ID:	Sequoyah Nuclear Plant, Outfall 101
End Date: 6/24/03	Lab ID: ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Data	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species:	PP-Pimephales promelas
Comments: UV-treated			

Conc-%	1	2	3	4
D-Control	0.7223	0.7683	0.8302	0.9229
10.98	0.8393	0.8305	0.9118	0.9435
22	0.9742	0.8300	0.8370	0.9422
43.9	0.8224	0.8330	0.9447	0.8981
72	0.9089	1.0447	1.0083	0.9705
100	1.0017	0.9383	0.8356	0.7454

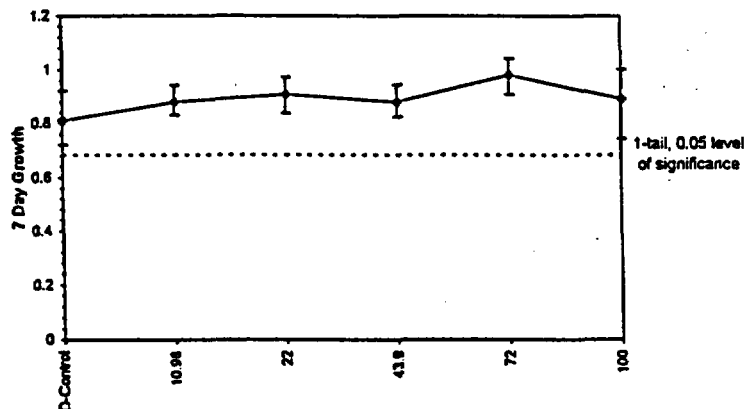
Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	0.8110	1.0000	0.8110	0.7223	0.9229	10.694	4				0.8927	1.0000
10.98	0.8813	1.0867	0.8813	0.8305	0.9435	6.258	4	-1.352	2.410	0.1254	0.8927	1.0000
22	0.9084	1.1201	0.9084	0.8370	0.9742	6.779	4	-1.872	2.410	0.1254	0.8927	1.0000
43.9	0.8796	1.0846	0.8796	0.8224	0.9447	6.073	4	-1.318	2.410	0.1254	0.8927	1.0000
72	0.9832	1.2123	0.9832	0.9089	1.0447	5.903	4	-3.309	2.410	0.1254	0.8927	1.0000
100	0.8928	1.1008	0.8928	0.7454	1.0017	12.221	4	-1.572	2.410	0.1254	0.8927	1.0000

Auxiliary Tests					Statistic	Critical	Skew	Kurt			
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )					0.97625077	0.884	-0.2164391	-0.3347123			
Bartlett's Test indicates equal variances ( $p = 0.78$ )					2.47064233	15.0863171					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDw	MSDp	MSB	MSE	F-Prob	df
Dunnnett's Test		100	>100		1	0.1233815	0.13460587	0.01232593	0.00541331	0.09053341	5, 18
Treatments vs D-Control											

Point	%	SD	95% CL(Exp)	Linear Interpolation (200 Resamples)	
				Skew	
IC05	>100				
IC10	>100				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Dose-Response Plot



# Environmental Testing Solutions, LLC

## Statistical Analyses

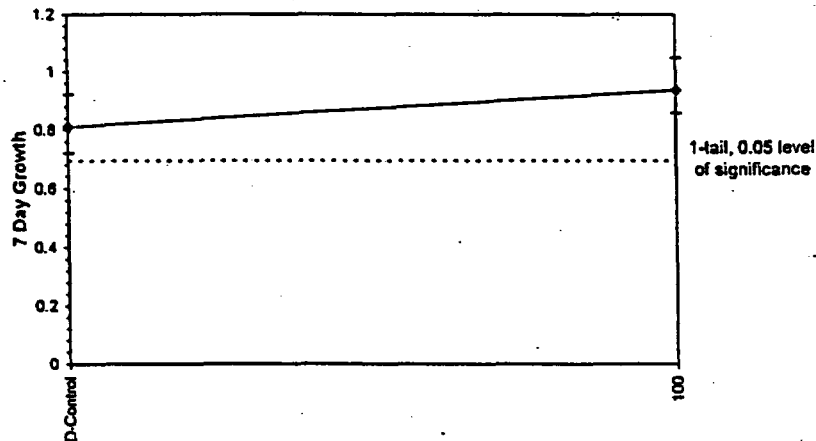
Larval Fish Growth and Survival Test-7 Day Growth			
Start Date: 6/17/03	Test ID: PpFRCR	Sample ID:	Sequoyah Nuclear Plant, Intake
End Date: 6/24/03	Lab ID: ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:	Protocol: CHRONIC (EPA-821-R-02-013)	Test Species:	PP-Pimephales promelas
Comments: UV-treated			

Conc-%	1	2	3	4
D-Control	0.7223	0.7683	0.8302	0.9229
100	0.8604	0.9160	0.9244	1.0484

Transform: Untransformed								1-Tailed		MSD
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	
D-Control	0.8110	1.0000	0.8110	0.7223	0.9229	10.694	4	-2.150	1.943	0.1142
100	0.9373	1.1558	0.9373	0.8604	1.0484	8.463	4			

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.8905884	0.749	0.64399405	-0.89201984		
F-Test indicates equal variances ( $p = 0.89$ )	1.19533205	47.4683456				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.11419269	0.14080913	0.03191601	0.00690685	0.07514437	1, 6
Treatments vs D-Control						

Dose-Response Plot



# Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)

Species: *Pimephales promelas*

## Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated  
Test dates: June 17 - 24, 2003  
Project number: 744

Reviewed by: CM

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.80	7.62	7.77	7.69	7.63	7.73	7.63	7.54	7.73	7.36	7.73	7.47	7.74	7.51
	DO (mg/L)	7.7	7.5	7.6	7.4	7.6	7.7	7.6	7.2	7.6	6.5	7.6	7.2	7.7	7.6
	Conductivity (µmhos/cm)	306		294		290		317		302		295		300	
	Alkalinity (mg/L CaCO <sub>3</sub> )	60.2		61.2								61.2			
	Hardness (mg/L CaCO <sub>3</sub> )	82.8		84.8								84.8			
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.2	24.7	25.3	24.3	25.1	24.6
10.98%	pH (SU)	7.69	7.60	7.69	7.67	7.75	7.69	7.72	7.58	7.72	7.44	7.76	7.47	7.67	7.50
	DO (mg/L)	7.6	7.4	7.8	7.4	7.8	7.6	7.9	7.4	7.5	6.5	7.6	7.1	7.7	7.6
	Conductivity (µmhos/cm)	301		290		287		280		296		276		282	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.3	24.7	25.3	24.3	25.0	24.7
22%	pH (SU)	7.70	7.54	7.67	7.67	7.75	7.69	7.71	7.54	7.72	7.46	7.74	7.52	7.67	7.52
	DO (mg/L)	7.8	7.3	7.8	7.4	7.8	7.6	7.9	7.4	7.5	6.6	7.6	7.2	7.7	7.7
	Conductivity (µmhos/cm)	284		279		276		273		282		265		273	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.2	24.7	25.3	24.3	25.0	24.7
43.9%	pH (SU)	7.66	7.54	7.66	7.67	7.70	7.67	7.64	7.53	7.68	7.43	7.71	7.50	7.66	7.51
	DO (mg/L)	7.9	7.2	7.8	7.4	7.8	7.6	7.9	7.4	7.6	6.7	7.6	7.4	7.7	7.8
	Conductivity (µmhos/cm)	248		243		247		242		246		233		240	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.1	24.5	25.2	24.7	25.4	24.3	25.0	24.7
72%	pH (SU)	7.62	7.54	7.60	7.63	7.69	7.67	7.56	7.54	7.61	7.48	7.69	7.51	7.60	7.50
	DO (mg/L)	7.8	7.2	7.8	7.4	7.9	7.8	7.8	7.5	7.7	6.7	7.6	7.3	7.8	7.7
	Conductivity (µmhos/cm)	215		206		204		204		207		199		204	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.1	24.5	25.3	24.7	25.4	24.3	24.8	24.7
100%	pH (SU)	7.57	7.47	7.52	7.60	7.62	7.64	7.43	7.50	7.55	7.42	7.66	7.48	7.60	7.46
	DO (mg/L)	7.9	7.3	7.9	7.4	8.0	7.6	7.8	7.6	7.9	6.9	7.6	7.3	7.8	7.6
	Conductivity (µmhos/cm)	169		167		167		165		167		164		166	
	Alkalinity (mg/L CaCO <sub>3</sub> )	57.1				58.1				57.1					
	Hardness (mg/L CaCO <sub>3</sub> )	62.6				66.7				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.5	25.4	24.7	25.4	24.3	24.7	24.7
	pH (SU)	7.59	7.46	7.56	7.62	7.67	7.64	7.47	7.49	7.54	7.41	7.53	7.43	7.50	7.45
	DO (mg/L)	8.0	7.4	7.9	7.4	7.9	7.7	8.0	7.6	7.9	6.8	7.8	7.3	7.8	7.8
	Conductivity (µmhos/cm)	168		165		166		164		163		161		164	
	Alkalinity (mg/L CaCO <sub>3</sub> )	58.1				58.1				57.1					
	Hardness (mg/L CaCO <sub>3</sub> )	64.6				62.6				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5	25.2	24.6	25.1	24.7	25.4	24.3	24.9	24.7

Species: *Pimephales promelas*Client: TVA-SECONDAHDate: 06-17-03NONTREATED

## Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.80	7.62	7.77	7.69	7.63	7.73
	DO (mg/L)	7.7	7.5	7.6	7.4	7.6	7.7
	Conductivity (umhos/cm)	306		294		290	
	Alkalinity (mg CaCO <sub>3</sub> /L)	60.2		61.2		—	
	Hardness (mg CaCO <sub>3</sub> /L)	82.8		85.4		—	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
10.98%	pH (S.U.)	7.69	7.60	7.69	7.67	7.73	7.69
	DO (mg/L)	7.6	7.4	7.8	7.4	7.8	7.6
	Conductivity (umhos/cm)	301		290		287	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
22%	pH (S.U.)	7.70	7.54	7.67	7.67	7.75	7.69
	DO (mg/L)	7.8	7.3	7.8	7.4	7.8	7.6
	Conductivity (umhos/cm)	284		279		270	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
43.9%	pH (S.U.)	7.66	7.54	7.66	7.67	7.70	7.67
	DO (mg/L)	7.9	7.2	7.8	7.4	7.8	7.6
	Conductivity (umhos/cm)	248		243		247	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
72%	pH (S.U.)	7.62	7.54	7.62	7.63	7.69	7.67
	DO (mg/L)	7.8	7.2	7.8	7.4	7.9	7.8
	Conductivity (umhos/cm)	215		206		204	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
100%	pH (S.U.)	7.57	7.47	7.52	7.60	7.62	7.64
	DO (mg/L)	7.9	7.3	7.9	7.4	8.0	7.6
	Conductivity (umhos/cm)	169		167		167	
	Alkalinity (mg CaCO <sub>3</sub> /L)	57.1				58.1	
	Hardness (mg CaCO <sub>3</sub> /L)	63.2				64.7	
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
100% INTAKE	pH (S.U.)	7.59	7.46	7.50	7.62	7.67	7.64
	DO (mg/L)	8.0	7.4	7.9	7.4	7.9	7.7
	Conductivity (umhos/cm)	168		165		166	
	Alkalinity (mg CaCO <sub>3</sub> /L)	58.1				58.1	
	Hardness (mg CaCO <sub>3</sub> /L)	65.6				63.6	
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	25.5	24.7	25.3	24.6	25.3	24.5
		Initial	Final	Initial	Final	Initial	Final



Species: *Pimephales promelas*Client: TVA - SequoyahDate: 06-17-03NONTREATED

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.63	7.54	7.73	7.30	7.73	7.47	7.74	7.51
	DO (mg/L)	7.6	7.2	7.6	6.5	7.6	7.2	7.7	7.6
	Conductivity (µmhos/cm)	317		302		295		300	
	Alkalinity (mg CaCO <sub>3</sub> /L)	—		—		646.2		—	
	Hardness (mg CaCO <sub>3</sub> /L)	—		—		854.8		—	
	Temperature (°C)	25.2	24.5	25.2	24.7	25.3	24.3	25.1	24.6
10.982	pH (S.U.)	7.72	7.58	7.72	7.44	7.70	7.47	7.67	7.50
	DO (mg/L)	7.9	7.4	7.5	6.5	7.6	7.1	7.7	7.6
	Conductivity (µmhos/cm)	280		296		276		282	
	Temperature (°C)	25.2	24.5	25.3	24.7	25.3	24.3	25.0	24.7
227	pH (S.U.)	7.71	7.54	7.72	7.46	7.74	7.52	7.67	7.52
	DO (mg/L)	7.9	7.4	7.5	6.6	7.6	7.2	7.7	7.7
	Conductivity (µmhos/cm)	273		282		265		273	
	Temperature (°C)	25.2	24.5	25.2	24.7	25.3	24.3	25.0	24.7
43.97	pH (S.U.)	7.64	7.53	7.68	7.43	7.71	7.50	7.66	7.51
	DO (mg/L)	7.9	7.4	7.6	6.7	7.6	7.4	7.7	7.8
	Conductivity (µmhos/cm)	242		246		233		240	
	Temperature (°C)	25.1	24.5	25.2	24.7	25.4	24.3	25.0	24.7
727	pH (S.U.)	7.50	7.54	7.61	7.48	7.69	7.51	7.60	7.50
	DO (mg/L)	7.8	7.5	7.7	6.7	7.6	7.3	7.8	7.7
	Conductivity (µmhos/cm)	204		207		199		204	
	Temperature (°C)	25.1	24.5	25.3	24.7	25.4	24.3	24.8	24.7
1002	pH (S.U.)	7.43	7.50	7.55	7.42	7.60	7.48	7.60	7.46
	DO (mg/L)	7.8	7.6	7.9	6.9	7.6	7.3	7.8	7.6
	Conductivity (µmhos/cm)	165		167		164		166	
	Alkalinity (mg CaCO <sub>3</sub> /L)			57.1					
	Hardness (mg CaCO <sub>3</sub> /L)			463.6					
	TR Chlorine (mg/L)			10.10					
	Temperature (°C)	25.2	24.5	25.4	24.7	25.4	24.3	24.7	24.7
1007 Intake	pH (S.U.)	7.47	7.49	7.54	7.41	7.53	7.43	7.50	7.45
	DO (mg/L)	8.0	7.6	7.9	6.8	7.8	7.3	7.8	7.8
	Conductivity (µmhos/cm)	164		163		161		164	
	Alkalinity (mg CaCO <sub>3</sub> /L)			57.1					
	Hardness (mg CaCO <sub>3</sub> /L)			463.6					
	TR chlorine (mg/L)			10.10					
	Temperature (°C)	25.2	24.6	25.1	24.7	25.4	24.3	24.7	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

# Environmental Testing Solutions, LLC

## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)

Species: *Ceriodaphnia dubia*

### Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: June 17 - 24, 2003

Project number: 744

Reviewed by: Cue

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.80	7.72	7.77	7.73	7.63	7.86	7.63	7.92	7.73	7.87	7.73	7.80	7.74	7.91
	DO (mg/L)	7.7	7.7	7.6	7.7	7.6	8.0	7.6	7.9	7.6	7.8	7.6	7.8	7.7	8.2
	Conductivity (µmhos/cm)	306		294		290		317		302		295		300	
	Alkalinity (mg/L CaCO <sub>3</sub> )	60.2		61.2								61.2			
	Hardness (mg/L CaCO <sub>3</sub> )	82.8		84.8								84.8			
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
10.98%	pH (SU)	7.69	7.73	7.69	7.73	7.75	7.88	7.72	7.95	7.72	7.93	7.76	7.81	7.67	7.97
	DO (mg/L)	7.6	7.6	7.8	7.6	7.8	8.0	7.8	8.0	7.5	7.8	7.6	7.9	7.7	8.3
	Conductivity (µmhos/cm)	301		290		287		280		296		276		282	
	Temperature (°C)	24.5	24.4	25.3	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
22%	pH (SU)	7.70	7.73	7.67	7.73	7.75	7.88	7.71	7.94	7.72	7.90	7.74	7.81	7.67	7.96
	DO (mg/L)	7.8	7.6	7.8	7.6	7.8	8.0	7.9	8.0	7.5	7.9	7.6	7.9	7.7	8.4
	Conductivity (µmhos/cm)	284		279		276		273		282		265		273	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
43.9%	pH (SU)	7.66	7.70	7.66	7.72	7.70	7.89	7.64	7.93	7.68	7.89	7.71	7.82	7.66	7.97
	DO (mg/L)	7.9	7.7	7.8	7.6	7.8	8.0	7.9	7.9	7.6	7.9	7.6	8.0	7.7	8.4
	Conductivity (µmhos/cm)	248		243		247		242		246		233		240	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
72%	pH (SU)	7.62	7.67	7.60	7.70	7.69	7.84	7.56	7.87	7.61	7.87	7.69	7.81	7.60	7.93
	DO (mg/L)	7.8	7.7	7.8	7.6	7.9	8.0	7.8	7.9	7.7	7.9	7.6	8.0	7.8	8.5
	Conductivity (µmhos/cm)	215		206		204		204		207		199		204	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
100%	pH (SU)	7.57	7.65	7.52	7.68	7.62	7.81	7.43	7.86	7.55	7.80	7.66	7.79	7.60	7.91
	DO (mg/L)	7.9	7.6	7.9	7.7	8.0	8.0	7.8	7.9	7.9	7.8	7.6	8.0	7.8	8.4
	Conductivity (µmhos/cm)	169		167		167		165		167		164		166	
	Alkalinity (mg/L CaCO <sub>3</sub> )	57.1				58.1				57.1					
	Hardness (mg/L CaCO <sub>3</sub> )	62.6				66.7				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
	pH (SU)	7.59	7.66	7.56	7.68	7.67	7.84	7.47	7.84	7.54	7.82	7.53	7.74	7.50	7.78
	DO (mg/L)	8.0	7.8	7.9	7.6	7.9	8.0	8.0	7.9	7.9	7.8	7.8	8.0	7.8	8.3
	Conductivity (µmhos/cm)	168		165		166		164		163		161		164	
	Alkalinity (mg/L CaCO <sub>3</sub> )	58.1				58.1				57.1					
	Hardness (mg/L CaCO <sub>3</sub> )	64.6				62.6				62.6					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
100% Intake	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5

Species: *Ceriodaphnia dubia*Client: TVA-SequoyahDate: 06-17-03

## Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.80	7.72	7.77	7.73	7.63	7.80
	DO (mg/L)	7.7	7.7	7.6	7.7	7.6	8.0
	Conductivity (µmhos/cm)	306		294		290	
	Alkalinity (mg CaCO <sub>3</sub> /L)	60.2		61.2		—	
	Hardness (mg CaCO <sub>3</sub> /L)	82.8		85.8		—	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
10.98%	pH (S.U.)	7.69	7.73	7.69	7.73	7.75	7.88
	DO (mg/L)	7.6	7.6	7.8	7.6	7.8	8.0
	Conductivity (µmhos/cm)	301		290		287	
	Temperature (°C)	24.5	24.4	25.3	24.4	25.4	24.5
22%	pH (S.U.)	7.70	7.73	7.67	7.73	7.76	7.88
	DO (mg/L)	7.8	7.6	7.8	7.6	7.8	8.0
	Conductivity (µmhos/cm)	284		279		276	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
43.9%	pH (S.U.)	7.66	7.70	7.66	7.72	7.70	7.89
	DO (mg/L)	7.9	7.7	7.8	7.6	7.8	8.0
	Conductivity (µmhos/cm)	240		243		247	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
72%	pH (S.U.)	7.62	7.67	7.60	7.70	7.69	7.84
	DO (mg/L)	7.8	7.7	7.8	7.6	7.9	8.0
	Conductivity (µmhos/cm)	215		200		204	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
100%	pH (S.U.)	7.57	7.65	7.52	7.68	7.62	7.81
	DO (mg/L)	7.9	7.6	7.9	7.7	8.0	8.0
	Conductivity (µmhos/cm)	169		167		167	
	Alkalinity (mg CaCO <sub>3</sub> /L)	57.1				58.1	
	Hardness (mg CaCO <sub>3</sub> /L)	62.6				67.6	
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
100% INTAKE	pH (S.U.)	7.59	7.66	7.56	7.68	7.67	7.84
	DO (mg/L)	8.0	7.8	7.9	7.6	7.9	8.0
	Conductivity (µmhos/cm)	168		165		166	
	Alkalinity (mg CaCO <sub>3</sub> /L)	58.1				58.1	
	Hardness (mg CaCO <sub>3</sub> /L)	64.6				63.6	
	TR chlorine (mg/L)	40.10				40.10	
	Temperature (°C)	24.5	24.4	25.2	24.4	25.4	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*Client: TVA - SEQUOYAHDate: 06-17-03

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.63	7.92	7.73	7.87	7.73	7.80	7.74	7.91
	DO (mg/L)	7.6	7.9	7.6	7.8	7.6	7.8	7.7	8.2
	Conductivity (µmhos/cm)	317		302		295		300	
	Alkalinity (mg CaCO <sub>3</sub> /L)	—		—		61.2		—	
	Hardness (mg CaCO <sub>3</sub> /L)	—		—		54.8 85µ		—	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
10.98%	pH (S.U.)	7.72	7.95	7.72	7.93	7.74	7.81	7.67	7.97
	DO (mg/L)	7.8	8.0	7.5	7.8	7.6	7.9	7.7	8.3
	Conductivity (µmhos/cm)	280		290		276		282	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
22%	pH (S.U.)	7.71	7.94	7.72	7.90	7.74	7.81	7.67	7.96
	DO (mg/L)	7.9	8.0	7.5	7.9	7.6	7.9	7.7	8.4
	Conductivity (µmhos/cm)	273		282		265		273	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
43.9%	pH (S.U.)	7.64	7.93	7.68	7.89	7.71	7.82	7.66	7.97
	DO (mg/L)	7.9	7.9	7.6	7.9	7.6	8.0	7.7	8.4
	Conductivity (µmhos/cm)	242		246		233		240	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
72%	pH (S.U.)	7.56	7.87	7.61	7.87	7.69	7.81	7.60	7.93
	DO (mg/L)	7.8	7.9	7.7	7.9	7.6	8.0	7.8	8.5
	Conductivity (µmhos/cm)	204		207		199		204	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
100%	pH (S.U.)	7.43	7.86	7.55	7.80	7.66	7.79	7.60	7.91
	DO (mg/L)	7.8	7.9	7.9	7.8	7.6	8.0	7.8	8.4
	Conductivity (µmhos/cm)	165		167		164		166	
	Alkalinity (mg CaCO <sub>3</sub> /L)			57.1					
	Hardness (mg CaCO <sub>3</sub> /L)			67.6 63µ					
	TR Chlorine (mg/L)	✓		0.10		✓		✓	
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
100% INTAKE	pH (S.U.)	7.47	7.84	7.54	7.82	7.53	7.74	7.54	7.78
	DO (mg/L)	8.0	7.9	7.9	7.8	7.8	8.0	7.87.50	8.3
	Conductivity (µmhos/cm)	164		163		161		164	
	Alkalinity (mg CaCO <sub>3</sub> /L)			57.1					
	Hardness (mg CaCO <sub>3</sub> /L)			67.6 63µ					
	TR chlorine (mg/L)			0.10					
	Temperature (°C)	25.6	24.4	25.1	24.3	24.6	24.5	24.7	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

# Environmental Testing Solutions, LLC

## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)

Species: *Pimephales promelas*

### Daily Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated

Test dates: June 17 - 24, 2003

Project number: 744

Reviewed by: *CR*

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.69	7.53	7.61	7.72	7.75	7.70	7.75	7.64	7.77	7.53	7.75	7.57	7.71	7.57
	DO (mg/L)	8.0	7.3	7.6	7.5	7.6	7.8	8.0	7.5	7.9	7.1	7.8	7.5	8.0	7.8
	Conductivity (µmhos/cm)	306		286		285		300		298		295		302	
	Alkalinity (mg/L CaCO <sub>3</sub> )	-		-								61			
	Hardness (mg/L CaCO <sub>3</sub> )	-		-								85			
	Temperature (°C)	25.4	24.8	25.4	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
10.98%	pH (SU)	7.72	7.47	7.63	7.68	7.76	7.66	7.76	7.59	7.77	7.52	7.76	7.49	7.72	7.52
	DO (mg/L)	7.9	7.2	7.6	7.4	7.5	7.6	8.0	7.5	7.8	7.0	7.8	7.3	8.0	7.6
	Conductivity (µmhos/cm)	300		279		279		296		288		287		294	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
22%	pH (SU)	7.71	7.44	7.61	7.68	7.76	7.66	7.76	7.60	7.77	7.48	7.76	7.49	7.73	7.49
	DO (mg/L)	7.8	7.2	7.6	7.4	7.6	7.7	8.0	7.4	7.8	6.9	7.8	7.4	8.0	7.5
	Conductivity (µmhos/cm)	284		269		266		282		275		274		280	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.2	24.6
43.9%	pH (SU)	7.70	7.45	7.59	7.68	7.73	7.64	7.73	7.58	7.76	7.43	7.77	7.48	7.69	7.48
	DO (mg/L)	7.9	7.1	7.6	7.4	7.7	7.5	7.8	7.4	7.8	6.9	7.8	7.4	8.0	7.6
	Conductivity (µmhos/cm)	248		234		235		249		242		240		244	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
72%	pH (SU)	7.67	7.42	7.57	7.65	7.70	7.60	7.67	7.54	7.70	7.42	7.75	7.43	7.67	7.46
	DO (mg/L)	7.9	7.1	7.6	7.5	7.7	7.5	7.7	7.4	7.8	6.7	7.8	7.4	7.9	7.6
	Conductivity (µmhos/cm)	216		200		200		210		203		204		206	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
100%	pH (SU)	7.63	7.42	7.52	7.64	7.67	7.58	7.62	7.50	7.66	7.46	7.74	7.47	7.64	7.49
	DO (mg/L)	7.9	7.1	7.6	7.6	7.7	7.4	7.7	7.5	7.9	6.8	7.6	7.5	7.9	7.8
	Conductivity (µmhos/cm)	170		163		163		169		166		167		168	
	Alkalinity (mg/L CaCO <sub>3</sub> )	-				-				-					
	Hardness (mg/L CaCO <sub>3</sub> )	-				-				-					
	Total Residual Chlorine (mg/L)	-				-				-					
100% Intake	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	24.8	24.6
	pH (SU)	7.63	7.43	7.52	7.63	7.67	7.57	7.59	7.54	7.61	7.44	7.69	7.36	7.54	7.46
	DO (mg/L)	7.9	7.2	7.6	7.3	7.6	7.5	7.8	7.4	7.9	6.9	7.7	7.1	7.8	7.7
	Conductivity (µmhos/cm)	166		160		162		165		166		164		161	
	Alkalinity (mg/L CaCO <sub>3</sub> )	-				-				-					
	Hardness (mg/L CaCO <sub>3</sub> )	-				-				-					
	Total Residual Chlorine (mg/L)	-				-				-					
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6

Species: *Pimephales promelas*Client: TVA - SequoiaDate: 06-17-03

## Daily Chemistry:

UV-TREATED

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.69	7.53	7.61	7.72	7.75	7.70
	DO (mg/L)	8.0	7.3	7.6	7.5	7.6	7.8
	Conductivity (µmhos/cm)	306		286		285	
	Alkalinity (mg CaCO <sub>3</sub> /L)	60 cr		64 cr		—	
	Hardness (mg CaCO <sub>3</sub> /L)	82 cr		85 cr		—	
	Temperature (°C)	25.4	24.8	25.4	24.6	25.3	24.7
10.98%	pH (S.U.)	7.72	7.47	7.63	7.68	7.76	7.66
	DO (mg/L)	7.9	7.2	7.6	7.4	7.5	7.6
	Conductivity (µmhos/cm)	300		279		279	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
22%	pH (S.U.)	7.71	7.44	7.61	7.68	7.76	7.66
	DO (mg/L)	7.8	7.2	7.6	7.4	7.6	7.7
	Conductivity (µmhos/cm)	284		269		266	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
43.9%	pH (S.U.)	7.70	7.45	7.59	7.68	7.73	7.64
	DO (mg/L)	7.9	7.1	7.6	7.4	7.7	7.5
	Conductivity (µmhos/cm)	248		234		235	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
72%	pH (S.U.)	7.67	7.42	7.57	7.65	7.70	7.60
	DO (mg/L)	7.9	7.1	7.6	7.5	7.7	7.5
	Conductivity (µmhos/cm)	216		200		200	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
100%	pH (S.U.)	7.63	7.42	7.52	7.64	7.67	7.58
	DO (mg/L)	7.9	7.1	7.6	7.6	7.7	7.4
	Conductivity (µmhos/cm)	170		163		163	
	Alkalinity (mg CaCO <sub>3</sub> /L)	57 cr		—		58 cr	
	Hardness (mg CaCO <sub>3</sub> /L)	63 cr		—		67 cr	
	TR chlorine (mg/L)	40.10 cr		—		40.10 cr	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
100% INTAKE	pH (S.U.)	7.63	7.43	7.52	7.63	7.67	7.57
	DO (mg/L)	7.9	7.2	7.6	7.3	7.6	7.5
	Conductivity (µmhos/cm)	166		160		162	
	Alkalinity (mg CaCO <sub>3</sub> /L)	58		—		58	
	Hardness (mg CaCO <sub>3</sub> /L)	65		—		65	
	TR chlorine (mg/L)	40.10		—		40.10	
	Temperature (°C)	25.4	24.8	25.3	24.6	25.3	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*Client: TVA - SequoyahDate: 06-17-03UV-TREATED

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.75	7.64	7.77	7.53	7.75	7.57	7.71	7.57
	DO (mg/L)	8.0	7.5	7.9	7.1	7.8	7.5	8.0	7.8
	Conductivity (µmhos/cm)	300		298		295		302	
	Alkalinity (mg CaCO <sub>3</sub> /L)	—		—		48		—	
	Hardness (mg CaCO <sub>3</sub> /L)	—		—		85		—	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
10.98%	pH (S.U.)	7.70	7.59	7.77	7.52	7.76	7.49	7.72	7.52
	DO (mg/L)	8.0	7.5	7.8	7.0	7.8	7.3	8.0	7.6
	Conductivity (µmhos/cm)	296		288		287		294	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
22%	pH (S.U.)	7.70	7.60	7.77	7.48	7.76	7.49	7.73	7.49
	DO (mg/L)	8.0	7.4	7.8	6.9	7.8	7.4	8.0	7.5
	Conductivity (µmhos/cm)	282		275		274		280	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.2	24.6
43.9%	pH (S.U.)	7.73	7.58	7.76	7.43	7.77	7.48	7.69	7.48
	DO (mg/L)	7.8	7.4	7.9	6.9	7.8	7.4	8.0	7.6
	Conductivity (µmhos/cm)	249		242		240		244	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
72%	pH (S.U.)	7.67	7.54	7.70	7.42	7.75	7.43	7.67	7.46
	DO (mg/L)	7.7	7.4	7.8	6.7	7.8	7.4	7.9	7.6
	Conductivity (µmhos/cm)	210		203		204		206	
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.0	24.6
100%	pH (S.U.)	7.62	7.50	7.66	7.46	7.74	7.47	7.64	7.49
	DO (mg/L)	7.7	7.5	7.9	6.8	7.6	7.5	7.9	7.8
	Conductivity (µmhos/cm)	169		166		167		168	
	Alkalinity (mg CaCO <sub>3</sub> /L)			57					
	Hardness (mg CaCO <sub>3</sub> /L)			63					
	TR Chlorine (mg/L)			60.10					
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	24.8	24.6
100% INTAKE	pH (S.U.)	7.59	7.54	7.61	7.44	7.69	7.36	7.54	7.46
	DO (mg/L)	7.8	7.4	7.9	6.9	7.7	7.1	7.8	7.7
	Conductivity (µmhos/cm)	165		166		164		161	
	Alkalinity (mg CaCO <sub>3</sub> /L)			57					
	Hardness (mg CaCO <sub>3</sub> /L)			63					
	TR chlorine (mg/L)			60.10					
	Temperature (°C)	25.7	24.8	25.4	24.7	24.6	24.3	25.1	24.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

# Alkalinity (EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/L
 Analyst CAJ/KEL  
 Date analyzed 06-24-03

Titrate samples to pH = 4.50 S.U.

**Titrant normality and multiplier determination:**

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/100 ml sample = N x 500
4.05	1NR074	1NR079	0.0	12.2	12.2	0.0205	10.2

**Laboratory control standard:**

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
1NSS136	100	100	12.2	21.8	9.6	10.2	98	98%

**Duplicate sample precision:**

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
06-17-03 B	MHS H <sub>2</sub> O	100	21.8	27.6	5.8	10.2	<sup>S</sup> 59	
	Duplicate	↓	27.6	33.8	6.2	↓	<sup>D</sup> 63	6.6%

**Matrix spike recovery:**

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
1NSS 136	50	33.8/100	27.6	38.7	11.1	10.2	113

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
63	50	100%

**Sample measurements:**

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
06-17-03 A	MHS H <sub>2</sub> O	100	18.7	24.7	6.0	10.2	61.2
06-17-03 C	MHS H <sub>2</sub> O	100	24.7	30.8	6.1		62.2
06-21-03 A	↓	100	30.8	36.8	6.0		61.2
06-21-03 B	↓	100	36.8	42.7	5.9		60.2
	DMRQA CdAC	100	12.1	18.0	5.9		60
	CdCR	100	18.0	23.8	5.8		59
	PPAC	100	23.8	30.5	6.7		68
	↓ PPCL	100	30.5	36.4	6.1		62
030617-03	Tryon I	100	36.6	1.1	14.5	↓	148

Reviewed by:

Jf

Date reviewed:

06-26-03



### Alkalinity (EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/L
 Analyst PAJ/KCK  
 Date analyzed 06-24-03

Titrate samples to pH = 4.50 S.U.

***Titrant normality and multiplier determination:***

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H <sub>2</sub> SO <sub>4</sub> = (5 ml Na <sub>2</sub> CO <sub>3</sub> x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

***Laboratory control standard:***

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS136	100	100	1.1	10.8	9.7	10.2	99	99%

***Duplicate sample precision:***

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)	%RPD = [(S - D) / ((S + D)/2)] x 100 (acceptable range = ± 10%)
030619.10	Tryon 2	100	10.8	22.4	11.6	10.2	<sup>S</sup> 118	
↓	Duplicate	↓	22.4	34.0	11.6	↓	<sup>D</sup> 118	—

***Matrix spike recovery:***

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg CaCO <sub>3</sub> /L)
INSS136	50	100	22.4	39.0	16.6	10.2	169

Sample alkalinity (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
118	51	102%

***Sample measurements:***

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg CaCO <sub>3</sub> /L)
030621.08	Tryon 3	100	39.0	65	17.5	10.2	178
030617.01	TVA SQN 101 1	100	6.5	12.1	5.6		57.1
030619.01	↓ 2	100	12.1	17.8	5.7		58.1
030621.06	↓ 3	100	17.8	23.4	5.6		57.1
030617.02	TVA SQN 101 1	100	23.5	29.2	5.7		58.1
030619.02	↓ 2	100	29.2	34.9	5.7		58.1
030621.07	↓ 3	100	40.7	46.3	5.6	↓	57.1

Reviewed by: JJDate reviewed: 06-26-03

**Total Hardness**  
**(EPA Method 130.2)**  
 Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/L

Analyst CA  
 Date analyzed 06-23-03

***Titrant normality and multiplier determination:***

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000) / 50 ml sample = N x 1000
INR078	INSS 092	0.1	10.0	9.9	0.0202	20.2

***Laboratory control standard:***

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS101	40	50	10.0	12.0	2.0	20.2	40.4	101%

***Duplicate sample precision:***

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S+D)/2)) x 100 (acceptable range = ± 10%)
06-17-03A	MHS H <sub>2</sub> O	50	12.0	16.2	42	20.2	<sup>S</sup> 85	
↓	Duplicate	↓	16.2	20.5	43	↓	<sup>D</sup> 87	2.3%

***Matrix spike recovery:***

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
INSS101	40	50	20.5	22.4	19	20.2	38

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
87	38	95%

***Sample measurements:***

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
	Blank (should be = 0 mg CaCO <sub>3</sub> /L)	50	0.0	0.1	0.1	20.2	2.0
06-17-03 B	MHS H <sub>2</sub> O	50	22.4	26.5	4.1		83 82.8
06-17-03 C	↓	50	26.5	32.7	4.2		85 84.8
06-21-03 A	↓	50	30.7	34.9	4.2		85 84.8
06-21-03 B	↓	50	34.9	39.0	4.1		83 82.8
	DMEQA cd AC	50	39.0	43.1	4.1		83
	CA CE	50	9.0	13.0	4.0		81
	PP AC	50	13.0	17.1	4.1		83
	PP CE	50	17.1	21.0	3.9		79
	Tryon Comp	50	21.0	22.9	1.9	↓	38

Note: If &gt;15ml of titrant is used, sample must be diluted.

Reviewed by: JF

Date reviewed

06-26-03

**Total Hardness**  
**(EPA Method 130.2)**

Matrix: Water, MDL = 1.0 mg CaCO<sub>3</sub>/L

Analyst CA  
Date analyzed 06-23-03

*Titrant normality and multiplier determination:*

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.019 - 0.022)	pH Factor or Multiplier = (N x 50000) / 50 ml sample = N x 1000

*Laboratory control standard:*

Reference standard number	True value (TV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg CaCO <sub>3</sub> /L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 101	40	50	22.9	25.0	2.1	20.2	42	105%

*Duplicate sample precision:*

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)	%RPD = ((S - D) / ((S + D) / 2)) x 100 (acceptable range = ± 10%)
030617.03	Tryon 1	50	25.0	27.1	2.1	20.2	<sup>S</sup> 42	
↓	Duplicate	50	27.1	29.1	2.0	↓	<sup>D</sup> 40	4.9%

*Matrix spike recovery: Tryon 2*

Reference standard number	Spike value (SV) (mg CaCO <sub>3</sub> /L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg CaCO <sub>3</sub> /L)
INSS 101	40	50	30.9	32.9	2.0	20.2	40

Sample hardness (B) (mg CaCO <sub>3</sub> /L)	Measured spike value (MV) MV = A - B (mg CaCO <sub>3</sub> /L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
36	40	100

*Sample measurements:*

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg CaCO <sub>3</sub> /L)
	Blank (should be = 0 mg CaCO <sub>3</sub> /L)					20.2	
030618.10	Tryon 2	50	29.1	30.9	1.8		36
030621.08	↓ 3	50	32.9	34.8	1.9		38
030617.01	TVA SQN 101 1	50	34.8	37.9	3.1		63 62.6
030619.01	↓ 2	50	37.9	41.2	3.3		67 66.7
030621.06	↓ 3	50	41.2	44.3	3.1		63 62.6
030617.02	TVA SQN 11N 1	50	44.3	47.5	3.2		65 64.6
030619.02	↓ 2	50	33.5	36.6	3.1		63 62.6
030621.07	↓ 3	50	36.6	39.7	3.1	↓	63 62.6

Note: If >15ml of titrant is used, sample must be diluted.

Reviewed by: JP

Date reviewed

0306-26-03

**Total Residual Chlorine  
(EPA Method 330.5)**

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst CAJ  
Date analyzed 06-17-03Iodide reagent: NR084  
Acid reagent: NR083**Calibration:**

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS 134</u>	<u>INSS 134</u>

Note: For samples with a residual chlorine of &gt; 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

**Laboratory control standard:**

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.549</u>	<u>109.8%</u>

**Duplicate sample precision:**

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\{(S - D) / ((S + D) / 2)\} \times 100$ (acceptable range = $\pm 10\%$ )
<u>030617.03</u>	<u>Tryon WWTP</u>	<u>pale yellow &amp; boiling</u>	<u>S &lt; 0.00195</u>	
<u>↓</u>	<u>Duplicate</u>	<u>pale yellow &amp; boiling</u>	<u>D &lt; 0.00209</u>	<u>-</u>

**Sample measurements:**

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<u>&lt; 0.0154</u>
<u>030617.01</u>	<u>NA-SQJ 101</u>	<u>no color, fine particles</u>	<u>&lt; 0.0122</u>
<u>030617.02</u>	<u>↓ Intake</u>	<u>no color, fine particles</u>	<u>&lt; 0.019</u>
<u>030616.01</u>	<u>Coenestone #1</u>	<u>no color, fine particles</u>	<u>&lt; 0.00462</u>
<u>030616.02</u>	<u>↓ 2</u>	<u>no color, fine particles</u>	<u>&lt; 0.00294</u>
<u>030616.03</u>	<u>↓ 3</u>	<u>pale yellow, clear</u>	<u>&lt; 0.00124</u>
<u>030616.04</u>	<u>↓ 4</u>	<u>lt. yellow, fine particles</u>	<u>&lt; 0.00913</u>
		<u>JP</u>	

Note: All samples were analyzed in excess of EPA recommended holding time (15 minutes) unless otherwise noted.

**Laboratory control standard:**

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.544</u>	<u>108.8%</u>

Reviewed by JP  
Date reviewed 06-26-03

Total Residual Chlorine  
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst CH  
Date analyzed 06-19-03Iodide reagent: INR 084  
Acid reagent: INR 083

## Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS 134</u>	<u>INSS 134</u>

Note: For samples with a residual chlorine of &gt; 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

## Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.521</u>	<u>104.2</u>

## Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = $\frac{(S - D)}{[(S+D)/2]} \times 100$ (acceptable range = $\pm 10\%$ )
<u>030618.10</u>	<u>Tryon WWTP</u>	<u>tan, floating</u>	<u>S 0.145</u>	
<u>↓</u>	<u>Duplicate</u>	<u>particles</u>	<u>D 0.148</u>	<u>2.05%</u>

## Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	<u>Blank (should be = &lt; 0.10 mg/L)</u>		<u>&lt; 0.0214</u>
<u>030619.01</u>	<u>TVA SQN 101</u>	<u>no color, clear</u>	<u>&lt; 0.00</u>
<u>030619.02</u>	<u>↓ Intake</u>	<u>tan, floating particles</u>	<u>0.0662</u>

Note: All samples were analyzed in excess of EPA recommended holding time (15 minutes) unless otherwise noted.

## Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
<u>INSS 134</u>	<u>0.50</u>	<u>0.468</u>	<u>93.6%</u>

Reviewed by J  
Date reviewed 06-26-03

Total Residual Chlorine  
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst KBL  
Date analyzed 06-21-03Iodide reagent: INR084  
Acid reagent: INR085

## Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	<u>INSS134</u>	<u>INSS134</u>

Note: For samples with a residual chlorine of &gt; 1.0 mg/L, the calibration range must be adjusted to bracket the chlorine levels of the samples.

## Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
<u>INSS134</u>	<u>0.50</u>	<u>0.502</u>	<u>100.4%</u>

## Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = ((S - D) / ((S+D)/2)) x 100 (acceptable range = ± 10%)
<u>030621.09</u>	<u>Tryon WWP</u>	<u>pale yellow, clear</u>	<u>S 10.0509</u>	
<u>↓</u>	<u>Duplicate</u>		<u>D 10.0505</u>	<u>-</u>

## Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<u>10.00945</u>
<u>030621.06</u>	<u>TA-SAN 101</u>	<u>no color, slightly cloudy</u>	<u>10.0121</u>
<u>030621.07</u>	<u>TA-SAN intake</u>	<u>brown, cloudy, dirt</u>	<u>10.0620</u>
<u>030621.05</u>	<u>Scotland neck</u>	<u>no color, clear</u>	<u>10.0226</u>
<u>030621.01</u>	<u>Express Food</u>	<u>no color, clear, lg flakes</u>	<u>10.00872</u>
<u>030621.02</u>	<u>Quantum - w/o</u>	<u>no color, clear</u>	<u>10.00644</u>
<u>030621.03</u>	<u>Quantum - with</u>	<u>no color, clear</u>	<u>10.00620</u>
<u>030621.04</u>	<u>Progress - LCC</u>	<u>no color, clear</u>	<u>10.00467</u>
<u>030621.08</u>	<u>Tryon PF</u>	<u>pale yellow, clear</u>	<u>10.0592</u>

Note: All samples were analyzed in excess of EPA recommended holding time (15 minutes) unless otherwise noted.

## Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
<u>INSS134</u>	<u>0.50</u>	<u>0.493</u>	<u>98.6%</u>

Reviewed by JH  
Date reviewed 06-26-03

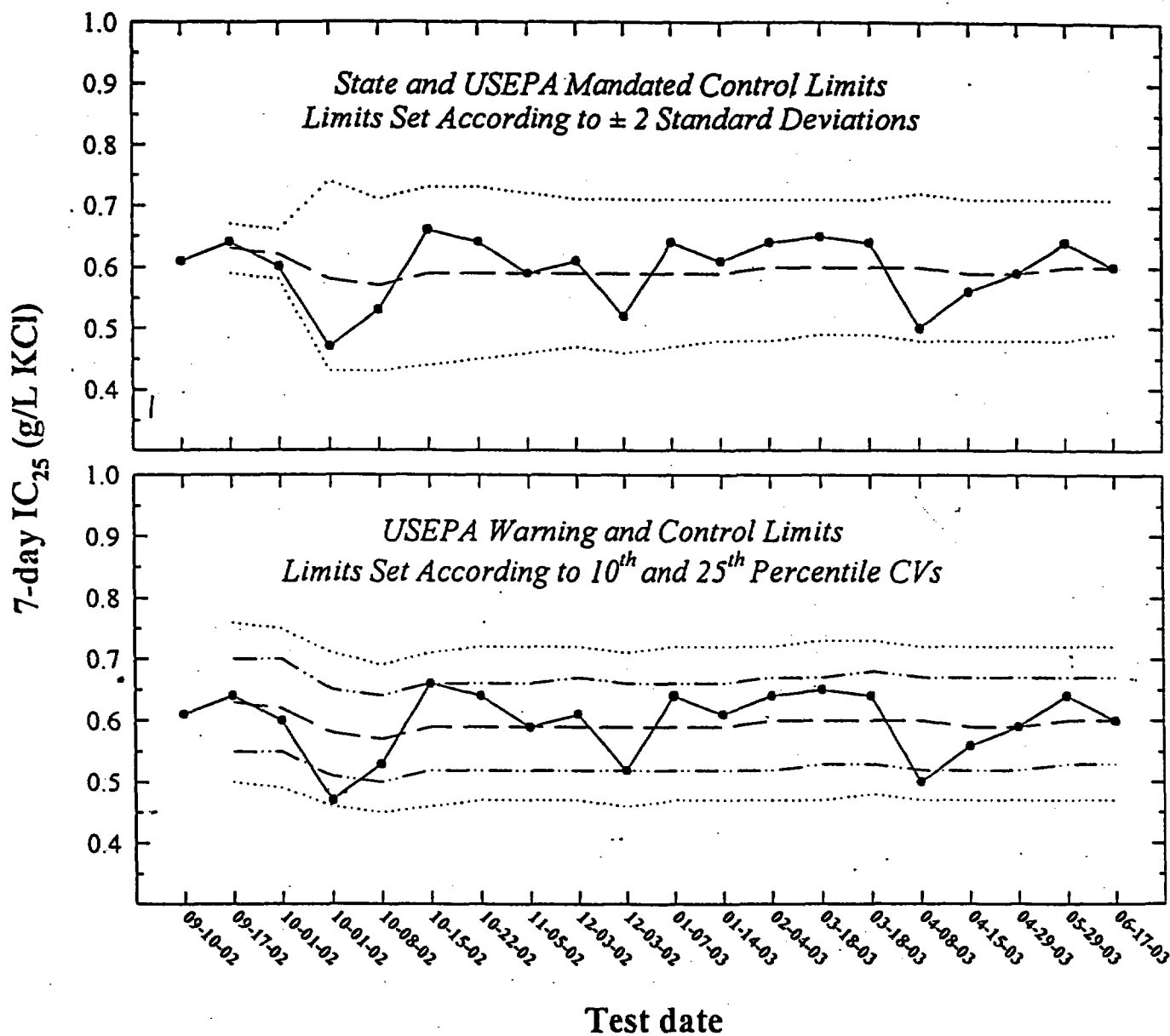
**Sequoyah Nuclear Plant Biomonitoring**  
**June 17 - 24, 2003**

**Appendix D**

**Reference Toxicant Test and  
Control Chart**

# Environmental Testing Solutions, LLC

## Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water



- 7-day  $IC_{25}$  = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.
- — Central Tendency (mean  $IC_{25}$ )
- · — · — Warning Limits (mean  $IC_{25} \pm S_{A,10}$ )
- Control Limits (mean  $IC_{25} \pm S_{A,25}$  or 2 Standard Deviations)



# Environmental Testing Solutions, LLC

## Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water

Test number	Test date	7-day IC <sub>25</sub> (g KCl/L)	CT (g/L KCl)	S	State and USEPA Control Limits		S <sub>A10</sub>	Laboratory Warning Limits		S <sub>A25</sub>	Laboratory Control Limits		S <sub>A75</sub>	USEPA Warning Limits		S <sub>A90</sub>	USEPA Control Limits		CV
					CT - 2S	CT + 2S		CT - S <sub>A10</sub>	CT + S <sub>A10</sub>		CT - S <sub>A25</sub>	CT + S <sub>A25</sub>		CT - S <sub>A75</sub>	CT + S <sub>A75</sub>		CT - S <sub>A90</sub>	CT + S <sub>A90</sub>	
1	09-10-02	0.61																	
2	09-17-02	0.64	0.63	0.02	0.59	0.67	0.08	0.55	0.70	0.13	0.50	0.76	0.24	0.39	0.87	0.28	0.35	0.91	0.03
3	10-01-02	0.60	0.62	0.02	0.58	0.66	0.07	0.55	0.70	0.13	0.49	0.75	0.24	0.38	0.86	0.28	0.34	0.90	0.03
4	10-01-02	0.47	0.58	0.08	0.43	0.74	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.80	0.26	0.32	0.85	0.13
5	10-04-02	0.53	0.57	0.07	0.43	0.71	0.07	0.50	0.64	0.12	0.45	0.69	0.22	0.35	0.79	0.26	0.31	0.83	0.13
6	10-15-02	0.66	0.59	0.07	0.44	0.73	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.12
7	10-22-02	0.64	0.59	0.07	0.45	0.73	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.12
8	11-05-02	0.59	0.59	0.06	0.46	0.72	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.11
9	12-03-02	0.61	0.59	0.06	0.47	0.71	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10
10	12-03-02	0.52	0.59	0.06	0.46	0.71	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.11
11	01-07-03	0.64	0.59	0.06	0.47	0.71	0.07	0.52	0.66	0.12	0.47	0.72	0.22	0.37	0.82	0.27	0.33	0.86	0.10
12	01-14-03	0.61	0.59	0.06	0.48	0.71	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10
13	02-04-03	0.64	0.60	0.06	0.48	0.71	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.87	0.10
14	03-18-03	0.65	0.60	0.06	0.49	0.71	0.07	0.53	0.67	0.13	0.47	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.09
15	03-18-03	0.64	0.60	0.06	0.49	0.71	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.09
16	04-08-03	0.50	0.60	0.06	0.48	0.72	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10
17	04-15-03	0.56	0.59	0.06	0.48	0.71	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10
18	04-29-03	0.59	0.59	0.06	0.48	0.71	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.10
19	05-29-03	0.64	0.60	0.06	0.48	0.71	0.07	0.53	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.87	0.09
20	06-17-03	0.60	0.60	0.05	0.49	0.71	0.07	0.53	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.87	0.09

Note: 7-d IC<sub>25</sub> = 7-day 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

CT = Central tendency (mean IC<sub>25</sub>).

S = Standard deviation of the IC<sub>25</sub> values.

### Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC<sub>25</sub> values corresponding to the 10th and 25th percentile CVs. These ranges are more stringent than the control and warning limits recommended by USEPA for the test method and endpoint.

S<sub>A10</sub> = Standard deviation corresponding to the 10<sup>th</sup> percentile CV. (S<sub>A10</sub> = 0.12)

S<sub>A25</sub> = Standard deviation corresponding to the 25<sup>th</sup> percentile CV. (S<sub>A25</sub> = 0.21)

### USEPA Control and Warning Limits

S<sub>A75</sub> = Standard deviation corresponding to the 75<sup>th</sup> percentile CV. (S<sub>A75</sub> = 0.38)

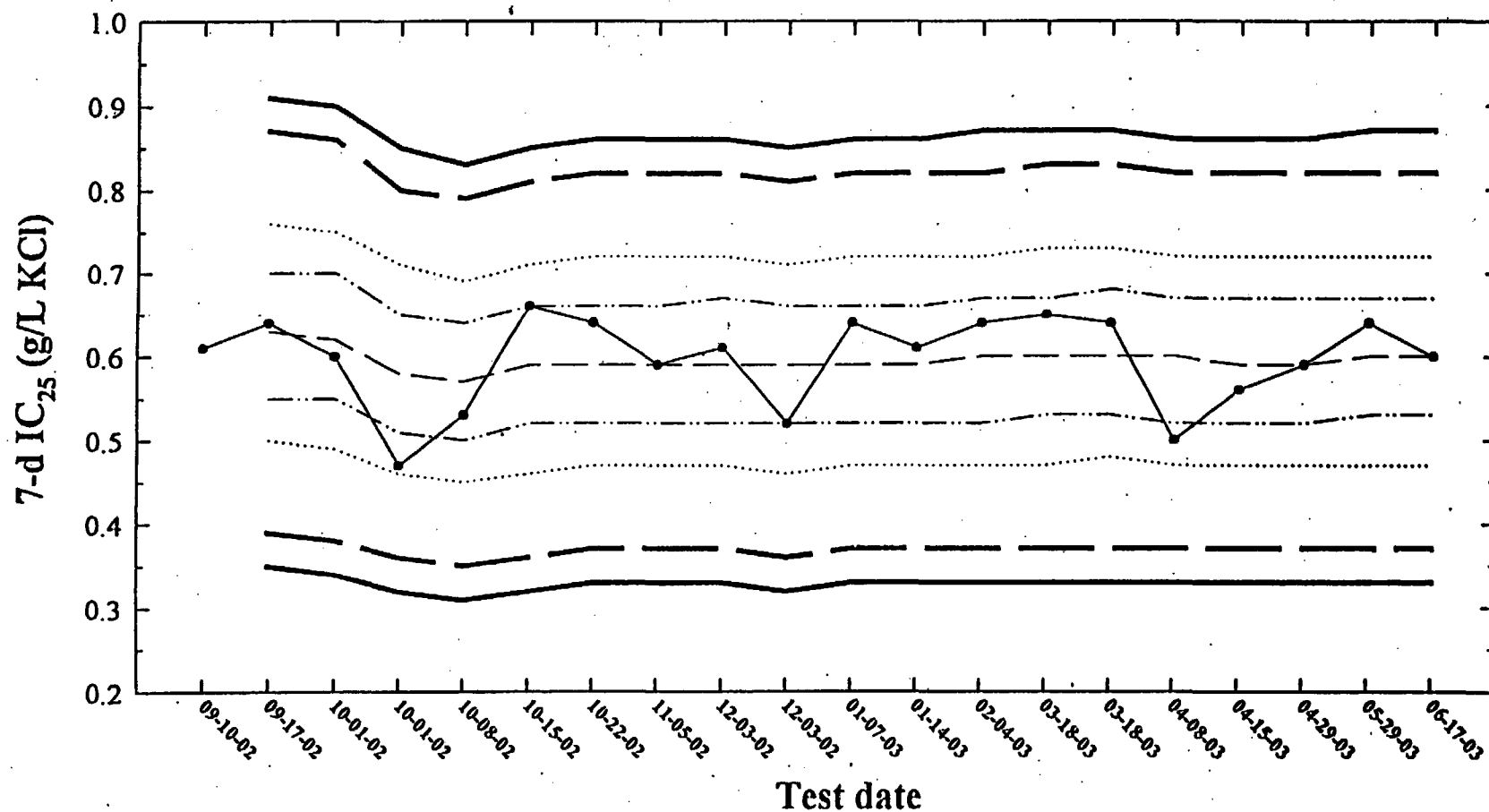
S<sub>A90</sub> = Standard deviation corresponding to the 90<sup>th</sup> percentile CV. (S<sub>A90</sub> = 0.45)

CV = Coefficient of variation of the IC<sub>25</sub> values.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

# Environmental Testing Solutions, LLC

## Potassium Chloride Chronic Reference Toxicant Control Chart for *Pimephales promelas* using Moderately Hard Synthetic Water



- 7-day  $IC_{25}$  = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.
- — Central Tendency (mean  $IC_{25}$ )
- · — Laboratory Warning Limits (mean  $IC_{25} \pm S_{A.10}$ ,  $S_{A.10} = 0.12$ )
- · · · Laboratory Control Limits (mean  $IC_{25} \pm S_{A.25}$ ,  $S_{A.25} = 0.21$ )
- — — USEPA Warning Limits (mean  $IC_{25} \pm S_{A.75}$ ,  $S_{A.75} = 0.38$ )
- — — USEPA Control Limits (mean  $IC_{25} \pm S_{A.90}$ ,  $S_{A.90} = 0.45$ )

# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

### Potassium Chloride Chronic Reference Toxicant Data for *Pimephales promelas* using Moderately Hard Synthetic Water

Test number	Test date	Control Survival	Control Mean Growth	CT	CV	CT	MSD	PMSD	CT
		(%)	(mg/larvae)	for Control Growth (mg/larvae)	(%)	for Control Growth CV (%)		(%)	for PMSD (%)
1	09-10-02	100	0.854		1.2		0.11	12.5	
2	09-17-02	100	0.824	0.839	13.4	7.3	0.12	14.6	13.6
3	10-01-02	97.5	0.750	0.809	18.4	11.0	0.19	25.4	17.5
4	10-01-02	100	0.975	0.851	12.7	11.4	0.13	12.8	16.3
5	10-08-02	97.5	0.929	0.866	8.0	10.7	0.18	19.5	17.0
6	10-15-02	100	1.037	0.895	16.9	11.8	0.23	21.9	17.8
7	10-22-02	100	0.822	0.884	10.6	11.6	0.13	15.6	17.5
8	11-05-02	100	0.874	0.883	2.8	10.5	0.12	13.8	17.0
9	12-03-02	100	0.852	0.880	9.1	10.3	0.12	13.7	16.6
10	12-03-02	100	0.668	0.858	10.4	10.4	0.15	22.4	17.2
11	01-07-03	100	0.886	0.861	4.1	9.8	0.14	15.7	17.1
12	01-14-03	100	0.677	0.846	3.0	9.2	0.07	11.0	16.6
13	02-04-03	97.5	0.933	0.852	14.1	9.6	0.15	16.5	16.6
14	03-18-03	100	0.838	0.851	8.0	9.5	0.15	18.5	16.7
15	03-18-03	100	0.803	0.848	21.3	10.3	0.21	26.5	17.4
16	04-08-03	100	1.083	0.863	6.1	10.0	0.09	8.0	16.8
17	04-15-03	100	0.892	0.864	17.0	10.4	0.17	18.7	16.9
18	04-29-03	97.5	1.021	0.873	6.7	10.2	0.18	17.5	16.9
19	05-29-03	100	1.005	0.880	7.9	10.1	0.11	11.1	16.6
20	06-17-03	97.5	0.888	0.880	4.2	9.8	0.18	20.7	16.8

Note: CV = Coefficient of variation for control growth.

On average, the CV for control growth is 9.8% in Environmental Testing Solutions, LLC *Pimephales* chronic toxicity tests.

Lower CV bound determined by USEPA (10<sup>th</sup> percentile) = 3.5%.

Upper CV bound determined by USEPA (90<sup>th</sup> percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control.

Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 9.4%.

Upper PMSD bound determined by USEPA (90<sup>th</sup> percentile) = 35%.

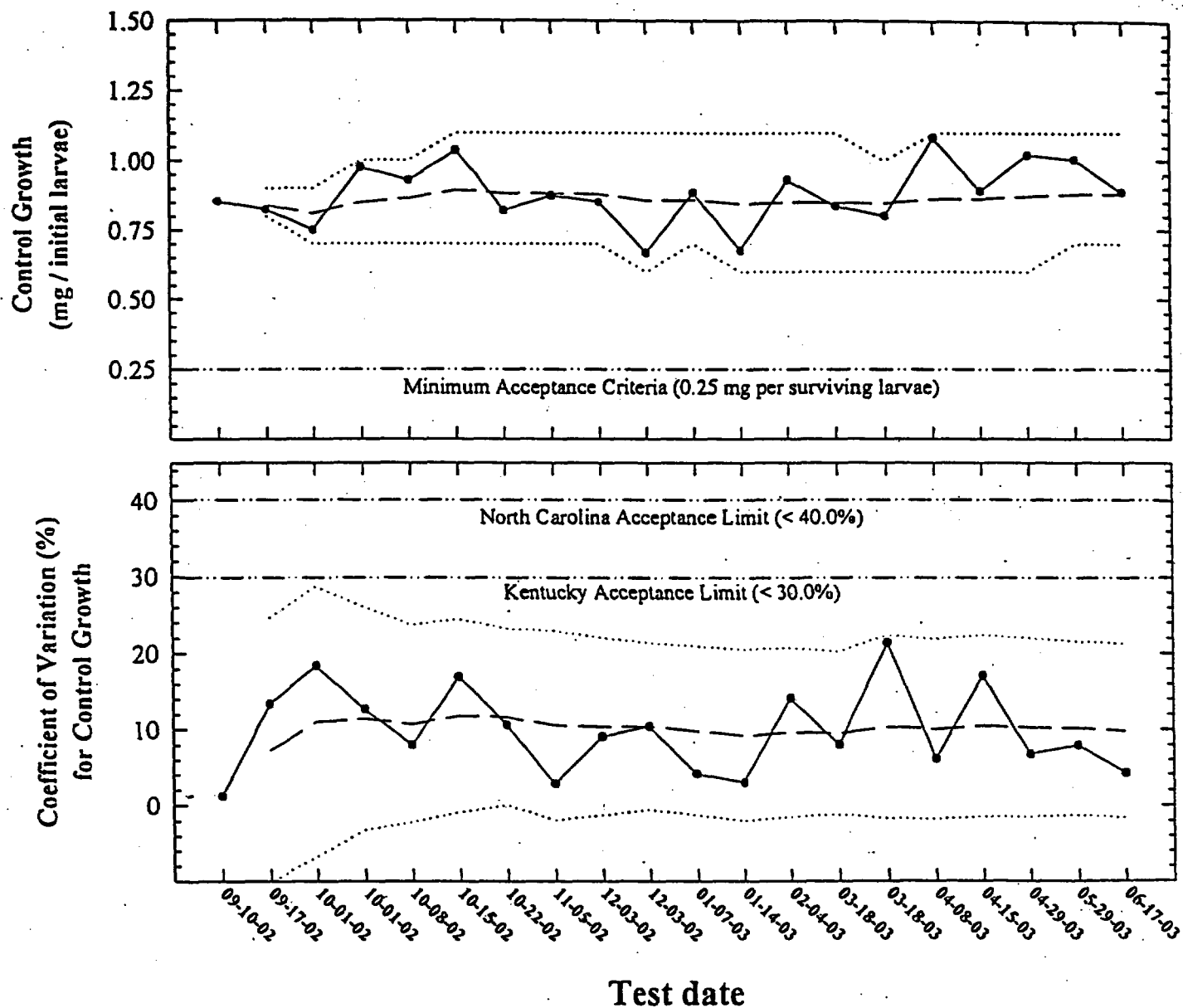
CT = Central Tendency (mean Control Growth, CV, or PMSD)

The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

# Environmental Testing Solutions, LLC

## *Pimephales promelas* Control Growth and Coefficient of Variation in Potassium Chloride Chronic Reference Toxicant Tests



- Control Growth or Coefficient of Variation (CV)
- Central Tendency (mean Control Growth or CV)
- ..... Control Limits (mean Control Growth or CV  $\pm$  2 Standard Deviations)

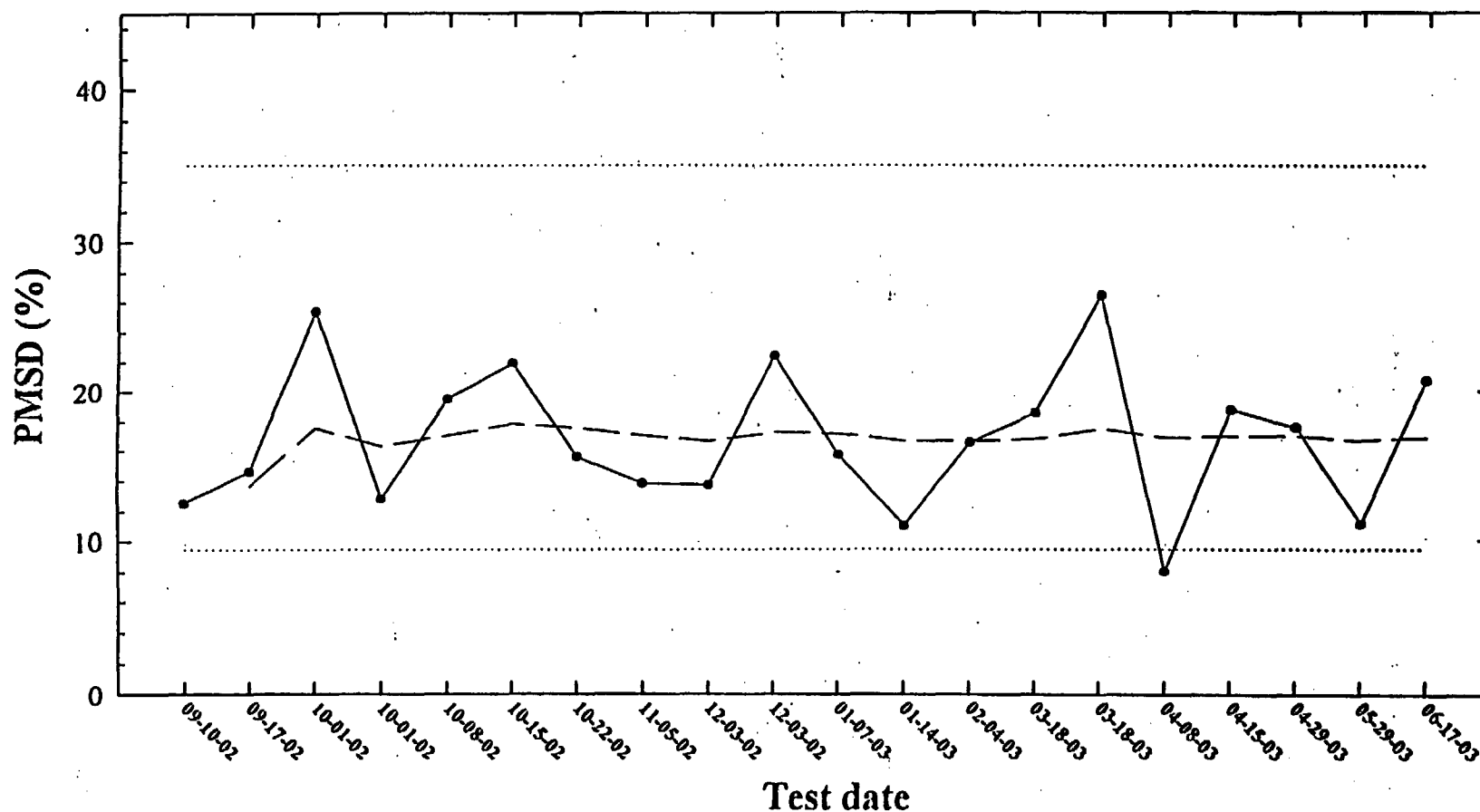
# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

### Potassium Chloride Chronic Reference Toxicant Control Chart

for *Pimephales promelas*

using Moderately Hard Synthetic Water



—●— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.  
- - - Central Tendency (mean PMSD)  
..... Lower and Upper PMSD Bounds  
Lower PMSD Bound (10<sup>th</sup> percentile) = 9.4%, Upper PMSD Bound (90<sup>th</sup> percentile) = 35%  
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

**Potassium Chloride Chronic Reference Toxicant Test**  
**(EPA-821-R-02-013 Method 1000.0)**  
**Species: *Pimephales promelas***

PpKCICR Test Number: 11

Dilution preparation information:						Comments:
KCl CHM number:	CHM 067					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water					
Dilution prep (mg/L)	300	450	600	750	900	
Stock volume (mL)	6	9	12	15	18	
Diluent volume (mL)	994	991	988	985	982	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:			Test information:	
Organism age:	26.75 - 28.75 hours old		Randomizing template:	RED
Date and times organisms were born between:	06-16-03 1100 TO 1300 HDT		Incubator number:	3
Organism source:	ABS BATCH 06-16-03		Artemia lot number:	B60403
Transfer bowl information:	pH = 8.00	Temperature = 24.7 °C	Total drying time:	Phx
			Date / Time in:	062403 1520
Average transfer volume:	10.4 mL		Date / Time out:	062503 1030
			Oven temperature:	103°C

**Daily feeding and renewal information:**

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Analyst
0	06-17-03	—	1500	1346	06-16-03	dl
1	06-18-03	0900	1500	1300	06-17-03	dl
2	06-19-03	0900	1500	1300	06-17-03	dl
3	06-20-03	1030	1635	1346	06-17-03	dl
4	06-21-03	0900	1500	1320	06-17-03	dl
5	06-22-03	0913	1520	1319	06-21-03	dl
6	06-23-03	0852	1500	1310	06-21-03	dl
7	06-24-03			1340		dl

Control information:		Acceptance criteria	Summary of test endpoints:	
% Mortality:	2.5%	≤ 20%	7-day LC <sub>50</sub>	736.7
Average weight per initial larvae:	0.8878		NOEC	300
Average weight per surviving larvae:	0.9139	≥ 0.25 mg/larvae	LOEC	450
			ChV	367.4
			IC <sub>25</sub>	602.2

PpKCICR Test Number: 11

## Survival and Growth Data

Day	CONTROL				300 mg KC/L				450 mg KC/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	9 <sup>d</sup>	10	10	10	9 <sup>d</sup>
3	10	9 <sup>d</sup>	10	10	10	10	10	9	10	10	10	9
4	10	9	10	10	10	10	10	9	10	10	10	9
5	10	9	10	10	10	10	10	9	10	9 <sup>d</sup>	10	9
6	10	9	10	10	10	10	10	9	10	9	10	9
7	10	9	10	10	10	10	10	9	10	9	10	9
A = Pan weight (mg) TRAY	15.184	15.160	14.809	14.647	15.106	14.874	14.686	15.047	14.791	14.659	15.303	14.801
B = Pan + Larvae weight (mg)	23.98	24.56	23.69	23.18	22.63	22.36	22.74	21.79	22.89	20.93	22.76	21.01
Larvae weight (mg) = A - B	1.0561	0.9371	0.8894	1.0587	1.0140	0.9885	0.9928	0.8540	1.0044	0.9999	0.8877	0.9844

0.8694 0.9400 0.8891 0.8533 0.7524 0.7400 0.6854 0.7443 0.8099 0.6771 0.7457 0.8204 - PER INSTANT WEIGHT  
 Calculations and data reviewed: *[Signature]*

Comments:

PpKCICR Test Number: 11

Survival and Growth Data

Day	600 mg KC/L				750 mg KC/L				900 mg KC/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	9 <sup>1d</sup>	8 <sup>2d</sup>	10	8 <sup>2d</sup>	8 <sup>2d</sup>	3 <sup>7d</sup>	1 <sup>9d</sup>	1 <sup>9d</sup>	1 <sup>9d</sup>
2	8 <sup>2d</sup>	10	10	9	5 <sup>3d</sup>	8 <sup>2d</sup>	8	6 <sup>2d</sup>	2 <sup>1d</sup>	1	1	1
3	8 <sup>2d</sup>	10	10	7 <sup>8d</sup>	4 <sup>1d</sup>	8	8	4 <sup>2d</sup>	2	1	1	1
4	8	10	10	5 <sup>3d</sup>	4	7 <sup>1d</sup>	7 <sup>1d</sup>	4	2	1	1	1
5	8	10	10	5	4	7	7 <sup>8d</sup>	4	2	1	1	1
6	8	10	10	5	4	6 <sup>1d</sup>	6	4	2	1	0 <sup>1d</sup>	1
7	8	10	10	5	4	6	6	4	2	1	—	1
A = Pan weight (mg)	15.151	14.835	14.766	14.798	15.110	15.098	15.042	14.910	15.053	15.122	—	14.801
B = Pan + Larvae weight (mg)	21.03	22.81	23.41	19.14	17.70	18.37	19.89	17.09	16.52	15.74	—	15.36
Larvae weight (mg) = A - B	0.5874	0.7975	0.8444	0.6914	0.2590	0.3272	0.4046	0.2180	0.1467	0.0613	—	0.0559

Calculations and data reviewed: *JK*

Per INITIAL WEIGHT

Comments:



# Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1000.0)

Species: *Pimephales promelas*

## Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Test number: PpKCICR # 51

Test dates: June 17-24, 2003

Reviewed by: Jumner

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = B - A	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15.284	23.980	8.696	0.8696	97.5	0.8878	4.3	Not applicable
	B	10	9	15.160	24.560	9.400	0.9400				
	C	10	10	14.809	23.690	8.881	0.8881				
	D	10	10	14.647	23.180	8.533	0.8533				
300	E	10	10	15.106	22.630	7.524	0.7524	97.5	0.7452	7.2	16.1
	F	10	10	14.874	22.360	7.486	0.7486				
	G	10	10	14.686	22.740	8.054	0.8054				
	H	10	9	15.047	21.790	6.743	0.6743				
450	I	10	10	14.791	22.890	8.099	0.8099	95.0	0.7009	13.2	21.0
	J	10	9	14.659	20.930	6.271	0.6271				
	K	10	10	15.303	22.760	7.457	0.7457				
	L	10	9	14.801	21.010	6.209	0.6209				
600	M	10	8	15.151	21.030	5.879	0.5879	82.5	0.6710	29.4	34.4
	N	10	10	14.835	22.810	7.975	0.7975				
	O	10	10	14.766	23.410	8.644	0.8644				
	P	10	5	14.798	19.140	4.342	0.4342				
750	Q	10	4	15.110	17.700	2.590	0.2590	50.0	0.3223	36.4	63.7
	R	10	6	15.098	18.370	3.272	0.3272				
	S	10	6	15.042	19.890	4.848	0.4848				
	T	10	4	14.910	17.090	2.180	0.2180				
900	U	10	2	15.053	16.520	1.467	0.1467	10.0	0.0660	91.8	92.6
	V	10	1	15.127	15.740	0.613	0.0613				
	W	10	0	0.000	0.000	0.000	0.0000				
	X	10	1	14.801	15.360	0.559	0.0559				

Dunnett's MSD value: 0.1841  
 PMSD: 20.7

MSD = Minimum Significant Difference  
 PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Pimephales* growth by 16.8% from the control (determined through reference toxicant testing).

Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.

Upper PMSD bound determined by USEPA (90th percentile) = 35%.

The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

# Environmental Testing Solutions, LLC

## Statistical Analyses

### Larval Fish Growth and Survival Test 7 Day Survival

Start Date: 6/17/03 Test ID: PKCICR  
 End Date: 6/24/03 Lab ID: ETS-Lav. Testing Solutions  
 Sample Date: Protocol: CRRONC (EPA-821-R-02-013) Sample ID:  
 Comments: Test Specie: PF-Permethrin premix

Conc. mg/L	1	2	3	4
D-Control	1.0000	6.5000	1.0000	1.0000
300	1.0000	1.0000	1.0000	0.5000
450	1.0000	6.5000	1.0000	0.5000
600	1.0000	1.0000	1.0000	0.5000
750	6.4000	6.6000	6.6000	0.4000
900	6.2000	6.1000	6.0000	0.1000

Conc. mg/L	Mean	N-Mean	Transform: Arcsin Square Root				L-Tail	Number	Total
			Mean	Min	Max	CV%			
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	0.000	2.410	0.2610
300	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	0.000	2.410	0.2610
450	0.9500	0.9744	1.3205	1.2690	1.4120	7.072	0.376	2.410	0.2610
600	0.9250	0.8462	1.1791	0.7834	1.4120	23.380	1.774	2.410	0.2610
750	0.5000	0.3128	0.7834	0.6847	0.8561	14.802	3.410	2.410	0.2610
900	0.1000	0.1026	0.3165	0.1588	0.4636	39.374	9.740	2.410	0.2610

Auxiliary Tests  
 Shapiro-Wilk's Test indicates normal distribution ( $p > 0.1$ )  
 Bartlett's Test indicates equal variances ( $p = 0.14$ )  
 Hypothesis Test (t-test, 8.05)  
 Dunnett's Test  
 Treatments vs D-Control

Parameter	Value	SE	95% Fiducial Limits	Statistic	Critical	Slow	Fast
Slope	12.89358778	2.31838561	8.34733664 17.24422178	0.931890067	0.884	0.76534356	1.340949804
Intercept	-31.975778	6.38054283	-44.4819931 -19.4698638	8.292373637	13.08631706		
TSCK	0.031770856	0.016773867	4.00010997 0.065647636	0.158213764	0.164685129	0.727507143	0.021433798

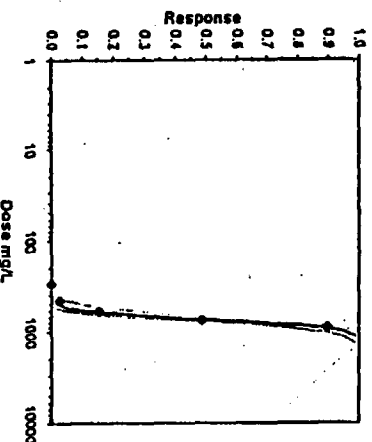
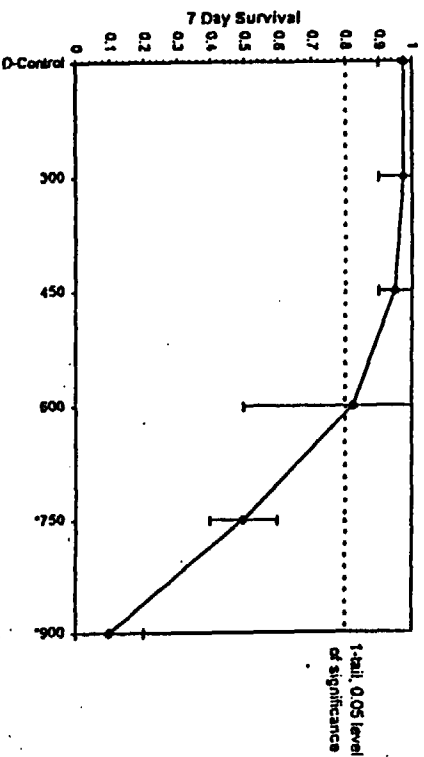
Treatments vs D-Control

Maximum Likelihood-Fit

Parameter	Value	SE	95% Fiducial Limits	Statistic	Critical	P-value	Mu	Sigma	Iter
Slope	12.89358778	2.31838561	8.34733664 17.24422178	0.931890067	0.884				
Intercept	-31.975778	6.38054283	-44.4819931 -19.4698638	8.292373637	13.08631706				
TSCK	0.031770856	0.016773867	4.00010997 0.065647636	0.158213764	0.164685129	0.727507143	0.021433798	3.0E-08	5.18

Parameter	Value	SE	95% Fiducial Limits	Statistic	Critical	P-value	Mu	Sigma	Iter
Slope	12.89358778	2.31838561	8.34733664 17.24422178	0.931890067	0.884				
Intercept	-31.975778	6.38054283	-44.4819931 -19.4698638	8.292373637	13.08631706				
TSCK	0.031770856	0.016773867	4.00010997 0.065647636	0.158213764	0.164685129	0.727507143	0.021433798	3.0E-08	5.18
P-value									
EC01	2.674	466.2681328	383.1186616 548.0302718						
EC03	1.335	549.1893128	461.3114678 602.0006732						
EC10	1.718	383.9934529	507.6910313 633.5088093						
EC15	3.964	612.2120114	541.0378473 656.1462239						
EC20	4.138	633.8821102	568.7841983 673.1280313						
EC25	4.376	653.0834138	593.330797 692.2809835						
EC30	4.747	704.0863597	637.1836683 740.6047299						
EC35	5.000	706.6679256	695.5037102 775.0073213						
EC40	5.233	770.7570224	712.1567234 815.2186902						
EC45	5.674	830.9499493	788.8186136 896.7146961						
EC50	5.842	856.1207614	810.1674501 933.9040839						
EC55	6.036	886.4245628	834.7208566 980.4493315						
EC60	6.282	976.0816561	865.523235 1043.709961						
EC65	6.645	988.146722	911.7407714 1146.990606						
EC69	7.326	1116.009105	1002.401815 1372.207238						

### Dose-Response Plot



# Environmental Testing Solutions, LLC

## Statistical Analyses

### Larval Fish Growth and Survival Test: 7 Day Growth

Start Date	6/17/03	Test ID:	PKCCR	Sample ID:	EEF-Rat Toxicant
End Date	6/24/03	Lab ID:	RTS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date		Protocol:	CHRONIC-CPA-621-R-02-013)	Test Species:	PF-Fungicides prometas
Comments:					
Conc-mg/L	1	2	3	4	
D-Control	0.696	0.940	0.881	0.833	
300	0.7324	0.7486	0.8034	0.6743	
450	0.8099	0.6771	0.7457	0.6309	
600	0.5879	0.7975	0.8644	0.4342	
750	0.1590	0.1272	0.4848	0.2180	
900	0.1467	0.0613	0.0000	0.0359	

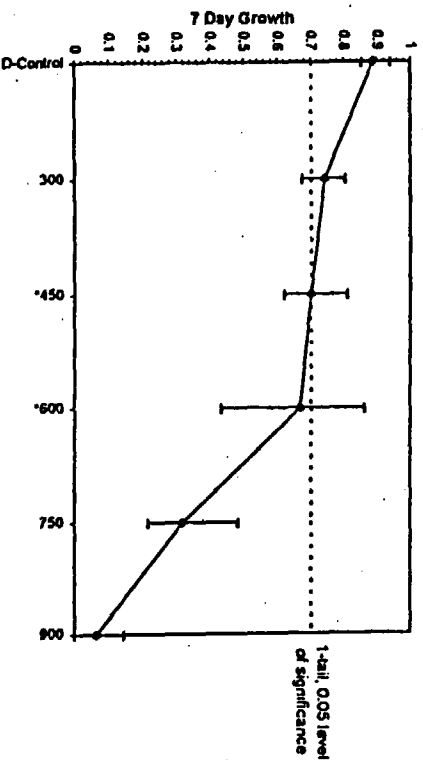
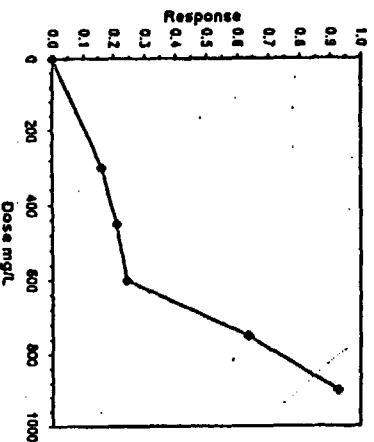
Conc-mg/L	Mean	N-Mean	Transform: Untransformed					Mean	N-Mean
			Mean	Min	Max	CV%	N		
D-Control	0.8378	1.0000	0.8378	0.8333	0.9400	4.238	4	0.8378	1.0000
300	0.7452	0.8394	0.7452	0.6743	0.8054	7.233	4	0.7452	0.8394
*450	0.7009	0.7893	0.7009	0.6309	0.8099	13.214	4	0.7009	0.7893
*600	0.6710	0.7358	0.6710	0.4342	0.8644	39.334	4	0.6710	0.7358
750	0.2723	0.3630	0.2723	0.2180	0.4848	36.417	4	0.2723	0.3630
900	0.0660	0.0743	0.0660	0.0000	0.1467	91.731	4	0.0660	0.0743

Auxiliary Tests		Statistic		Critical		Skew		Kurt	
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )		0.967983842		0.844		-0.30183013		1.054611001	
Bartlett's Test indicates equal variances ( $p = 0.05$ )		794131108		11.34483201					
Hypothesis Test (1-tail, 0.05)		NOEC		LOEC		CNV		TU	
Dunnnett's Test		300		450		367.4234614		0.184080939	
Treatments vs D-Control						0.207356734		0.036839111	
						0.0129234		0.081833921	
								3.17	

Linear Interpretation (200 Randomizes)

Point	mg/L	SD	95% C.I.(Exp)	Skew
IC03*	93.40	20.07	53.35	173.71
IC05*	186.80	39.92	106.51	331.43
IC10*	280.19	88.40	159.76	796.37
IC15*	418.49	108.66	186.08	737.95
IC20	602.23	72.70	287.69	660.99
IC25	659.51	22.66	575.95	712.63
IC30	697.69	20.49	636.15	771.18
IC35				0.1075

\* indicates IC estimate less than the lowest concentration



PpKCICR Test Number: 11

## Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.80	7.58	7.77	7.61	7.63	7.47
	DO (mg/L)	7.7	7.3	7.6	7.5	7.6	7.5
	Conductivity (µmhos/cm)	306		294		290	
	Alkalinity (mg CaCO <sub>3</sub> /L)	60		61		—	
	Hardness (mg CaCO <sub>3</sub> /L)	82		85		—	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
300 mg KC/L	pH (S.U.)	7.83	7.64	7.80	7.69	7.81	7.73
	DO (mg/L)	7.6	7.3	7.6	7.4	7.9	7.6
	Conductivity (µmhos/cm)	844		856		847	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
450 mg KC/L	pH (S.U.)	7.85	7.66	7.82	7.72	7.82	7.75
	DO (mg/L)	7.6	7.4	7.7	7.5	8.0	7.5
	Conductivity (µmhos/cm)	1100		1130		1103	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
600 mg KC/L	pH (S.U.)	7.87	7.70	7.83	7.72	7.84	7.74
	DO (mg/L)	7.6	7.4	7.7	7.4	7.9	7.4
	Conductivity (µmhos/cm)	1373		1381		1376	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
750 mg KC/L	pH (S.U.)	7.87	7.69	7.84	7.76	7.85	7.77
	DO (mg/L)	7.6	7.4	7.7	7.6	7.9	7.5
	Conductivity (µmhos/cm)	1635		1656		1618	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
900 mg KC/L	pH (S.U.)	7.87	7.68	7.85	7.78	7.86	7.84
	DO (mg/L)	7.7	7.4	7.8	7.6	7.9	7.5
	Conductivity (µmhos/cm)	1879		1870		1853	
	Temperature (°C)	25.2	24.8	25.2	24.7	25.4	24.6
		Initial	Final	Initial	Final	Initial	Final

Stock  
46100

46300

45500

PpKCICR Test Number: 11

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.64	7.41	7.73	7.29	7.73	7.46	7.74	7.48
	DO (mg/L)	7.6	7.0	7.6	6.7	7.6	7.4	7.7	7.7
	Conductivity (µmhos/cm)	317		302		295		300	
	Alkalinity (mg CaCO <sub>3</sub> /L)	—		—		61		—	
	Hardness (mg CaCO <sub>3</sub> /L)	—		—		85		—	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
300 mg KCl/L	pH (S.U.)	7.77	7.57	7.87	7.52	7.82	7.49	7.76	7.53
	DO (mg/L)	7.7	7.2	7.7	7.2	7.9	7.3	7.8	7.4
	Conductivity (µmhos/cm)	872		864		856		874	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
450 mg KCl/L	pH (S.U.)	7.84	7.59	7.89	7.54	7.84	7.53	7.78	7.57
	DO (mg/L)	7.7	7.3	7.7	7.1	7.8	7.2	7.9	7.5
	Conductivity (µmhos/cm)	1140		1131		1119		1141	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
600 mg KCl/L	pH (S.U.)	7.84	7.60	7.90	7.51	7.86	7.53	7.81	7.59
	DO (mg/L)	7.8	7.3	7.8	6.8	7.9	7.2	7.9	7.5
	Conductivity (µmhos/cm)	1404		1379		1377		1406	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
750 mg KCl/L	pH (S.U.)	7.86	7.68	7.92	7.53	7.86	7.56	7.82	7.62
	DO (mg/L)	7.9	7.2	7.8	6.8	7.9	7.2	8.0	7.5
	Conductivity (µmhos/cm)	1676		1663		1649		1672	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
900 mg KCl/L	pH (S.U.)	7.88	7.67	7.92	7.55	7.86	7.57	7.84	7.63
	DO (mg/L)	7.9	7.4	7.9	7.0	7.9	7.2	7.9	7.5
	Conductivity (µmhos/cm)	1888		1892		1870		1895	
	Temperature (°C)	25.5	24.4	25.0	24.3	24.5	24.4	25.3	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Stock

45100

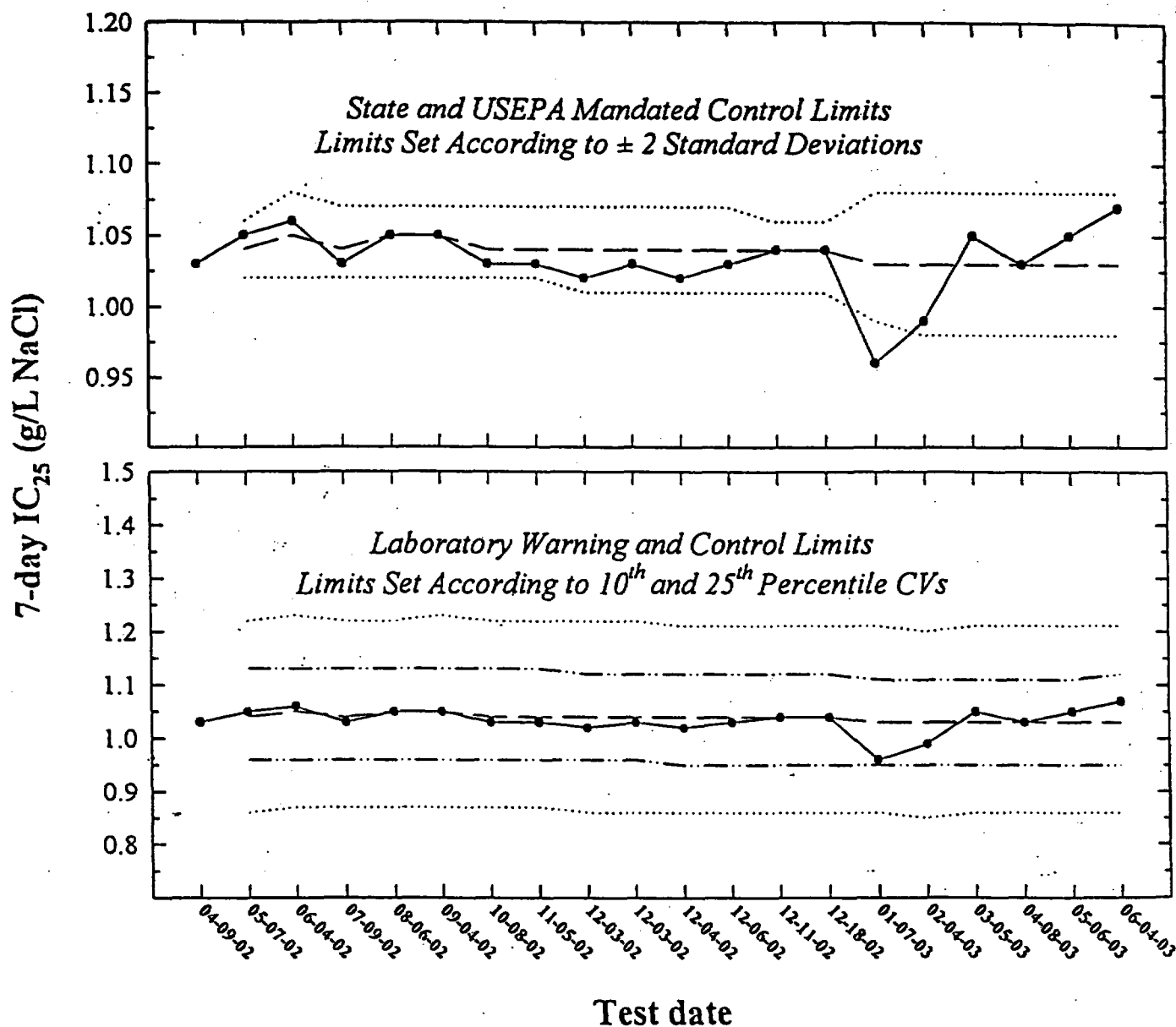
45000

44400

44900

# Environmental Testing Solutions, LLC

## Sodium Chloride Chronic Reference Toxicant Control Chart for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water



- 7-day  $IC_{25}$  = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.
- — Central Tendency (mean  $IC_{25}$ )
- · — Warning Limits (mean  $IC_{25} \pm S_{A10}$ )
- Control Limits (mean  $IC_{25} \pm S_{A25}$  or 2 Standard Deviations)

# Environmental Testing Solutions, LLC

## Sodium Chloride Chronic Reference Toxicant Control Chart for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water

Test number	Test date	7-day IC <sub>25</sub> (g NaCl/L)	CT (g/L NaCl)	S	State and USEPA Control Limits		S <sub>A10</sub>	Laboratory Warning Limits		S <sub>A25</sub>	Laboratory Control Limits		S <sub>A75</sub>	USEPA Warning Limits		S <sub>A90</sub>	USEPA Control Limits		CV
					CT - 2S	CT + 2S		CT - S <sub>A10</sub>	CT + S <sub>A10</sub>		CT - S <sub>A25</sub>	CT + S <sub>A25</sub>		CT - S <sub>A75</sub>	CT + S <sub>A75</sub>		CT - S <sub>A90</sub>	CT + S <sub>A90</sub>	
1	04-09-02	1.03																	
2	05-07-02	1.05	1.04	0.01	1.02	1.06	0.08	0.96	1.13	0.18	0.86	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01
3	06-04-02	1.06	1.05	0.01	1.02	1.08	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.01
4	07-09-02	1.03	1.04	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01
5	08-06-02	1.05	1.05	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.58	1.52	0.65	0.40	1.70	0.01
6	09-04-02	1.05	1.05	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.01
7	10-08-02	1.03	1.04	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01
8	11-05-02	1.03	1.04	0.01	1.02	1.07	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01
9	12-03-02	1.02	1.04	0.01	1.01	1.07	0.08	0.96	1.12	0.18	0.86	1.22	0.47	0.57	1.51	0.64	0.40	1.69	0.01
10	12-03-02	1.03	1.04	0.01	1.01	1.07	0.08	0.96	1.12	0.18	0.86	1.22	0.47	0.57	1.51	0.64	0.39	1.68	0.01
11	12-04-02	1.02	1.04	0.02	1.01	1.07	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01
12	12-06-02	1.03	1.04	0.01	1.01	1.07	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01
13	12-11-02	1.04	1.04	0.01	1.01	1.06	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01
14	12-18-02	1.04	1.04	0.01	1.01	1.06	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01
15	01-07-03	0.96	1.03	0.02	0.99	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.02
16	02-04-03	0.99	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.17	0.85	1.20	0.46	0.57	1.49	0.64	0.39	1.67	0.02
17	03-05-03	1.05	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.49	0.64	0.39	1.67	0.02
18	04-08-03	1.03	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.49	0.64	0.39	1.67	0.02
19	05-06-03	1.05	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.02
20	06-04-03	1.07	1.03	0.02	0.98	1.08	0.08	0.95	1.12	0.18	0.86	1.21	0.46	0.57	1.50	0.64	0.39	1.67	0.02

Note: 7-d IC<sub>25</sub> = 7-day 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

CT = Central tendency (mean IC<sub>25</sub>).

S = Standard deviation of the IC<sub>25</sub> values.

### Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC<sub>25</sub> values corresponding to the 10th and 25th percentile CVs. These ranges are more stringent than the control and warning limits recommended by USEPA for the test method and endpoint.

S<sub>A10</sub> = Standard deviation corresponding to the 10<sup>th</sup> percentile CV. (S<sub>A10</sub> = 0.08)

S<sub>A25</sub> = Standard deviation corresponding to the 25<sup>th</sup> percentile CV. (S<sub>A25</sub> = 0.17)

### USEPA Control and Warning Limits

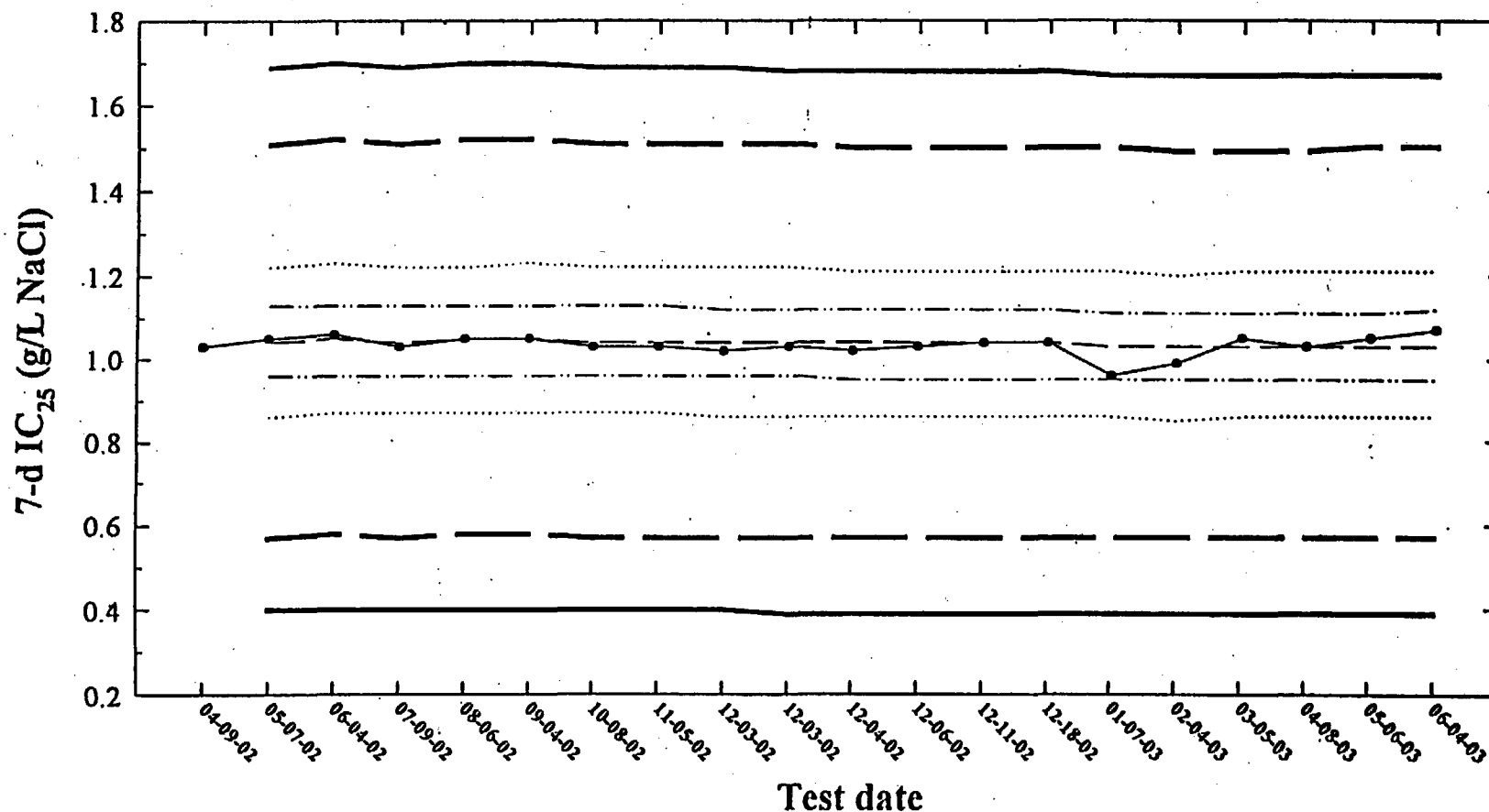
S<sub>A75</sub> = Standard deviation corresponding to the 75<sup>th</sup> percentile CV. (S<sub>A75</sub> = 0.45)

S<sub>A90</sub> = Standard deviation corresponding to the 90<sup>th</sup> percentile CV. (S<sub>A90</sub> = 0.62)

CV = Coefficient of variation of the IC<sub>25</sub> values.

# Environmental Testing Solutions, LLC

## Sodium Chloride Chronic Reference Toxicant Control Chart for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water



- 7-day IC<sub>25</sub> = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.
- — Central Tendency (mean IC<sub>25</sub>)
- — Laboratory Warning Limits (mean IC<sub>25</sub> ± S<sub>A.10</sub>, S<sub>A.10</sub> = 0.08)
- ..... Laboratory Control Limits (mean IC<sub>25</sub> ± S<sub>A.25</sub>, S<sub>A.25</sub> = 0.17)
- — USEPA Warning Limits (mean IC<sub>25</sub> ± S<sub>A.75</sub>, S<sub>A.75</sub> = 0.45)
- USEPA Control Limits (mean IC<sub>25</sub> ± S<sub>A.90</sub>, S<sub>A.90</sub> = 0.62)



# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

### Sodium Chloride Chronic Reference Toxicant Data for *Ceriodaphnia dubia* using Moderately Hard Synthetic Water

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CT for Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	04-09-02	100	26.2		8.6		2.8	10.7	
2	05-07-02	100	27.3	26.8	12.3	10.5	2.3	8.4	9.5
3	06-04-02	100	26.0	26.5	8.1	9.7	3.8	14.7	11.2
4	07-09-02	100	29.5	27.3	9.9	9.7	3.5	11.7	11.4
5	08-06-02	100	28.4	27.5	8.0	9.4	2.7	9.5	11.0
6	09-04-02	100	31.4	28.1	10.4	9.6	3.0	9.5	10.7
7	10-08-02	100	31.1	28.6	6.7	9.2	2.9	9.4	10.5
8	11-05-02	100	29.5	28.7	9.2	9.2	2.5	8.4	10.3
9	12-03-02	90	34.0	29.3	8.0	9.0	2.7	8.0	10.0
10	12-03-02	100	33.2	29.7	6.2	8.7	3.3	9.9	10.0
11	12-04-02	100	32.5	29.9	6.0	8.5	3.2	9.8	10.0
12	12-06-02	100	29.7	29.9	11.0	8.7	3.0	10.0	10.0
13	12-11-02	100	33.8	30.2	13.7	9.1	2.9	8.5	9.9
14	12-18-02	100	30.5	30.2	7.4	9.0	2.9	9.4	9.8
15	01-07-03	100	33.2	30.4	7.0	8.8	2.9	8.6	9.8
16	02-04-03	100	32.3	30.5	8.1	8.8	2.7	8.4	9.7
17	03-05-03	100	28.7	30.4	5.1	8.6	3.5	12.1	9.8
18	04-11-03	100	26.3	30.2	6.2	8.4	2.5	9.6	9.8
19	05-06-03	100	27.6	30.1	10.8	8.6	3.2	11.5	9.9
20	06-04-03	100	25.9	29.9	5.9	8.4	2.6	10.1	9.9

**Note:**

CV = Coefficient of variation for control reproduction.

On average, the CV for control reproduction is 8.4% in Environmental Testing Solutions, LLC *Ceriodaphnia* chronic

Lower CV bound determined by USEPA (10<sup>th</sup> percentile) = 8.9%.

Upper CV bound determined by USEPA (90<sup>th</sup> percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.9% from the control.

Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 11%.

Upper PMSD bound determined by USEPA (90<sup>th</sup> percentile) = 37%.

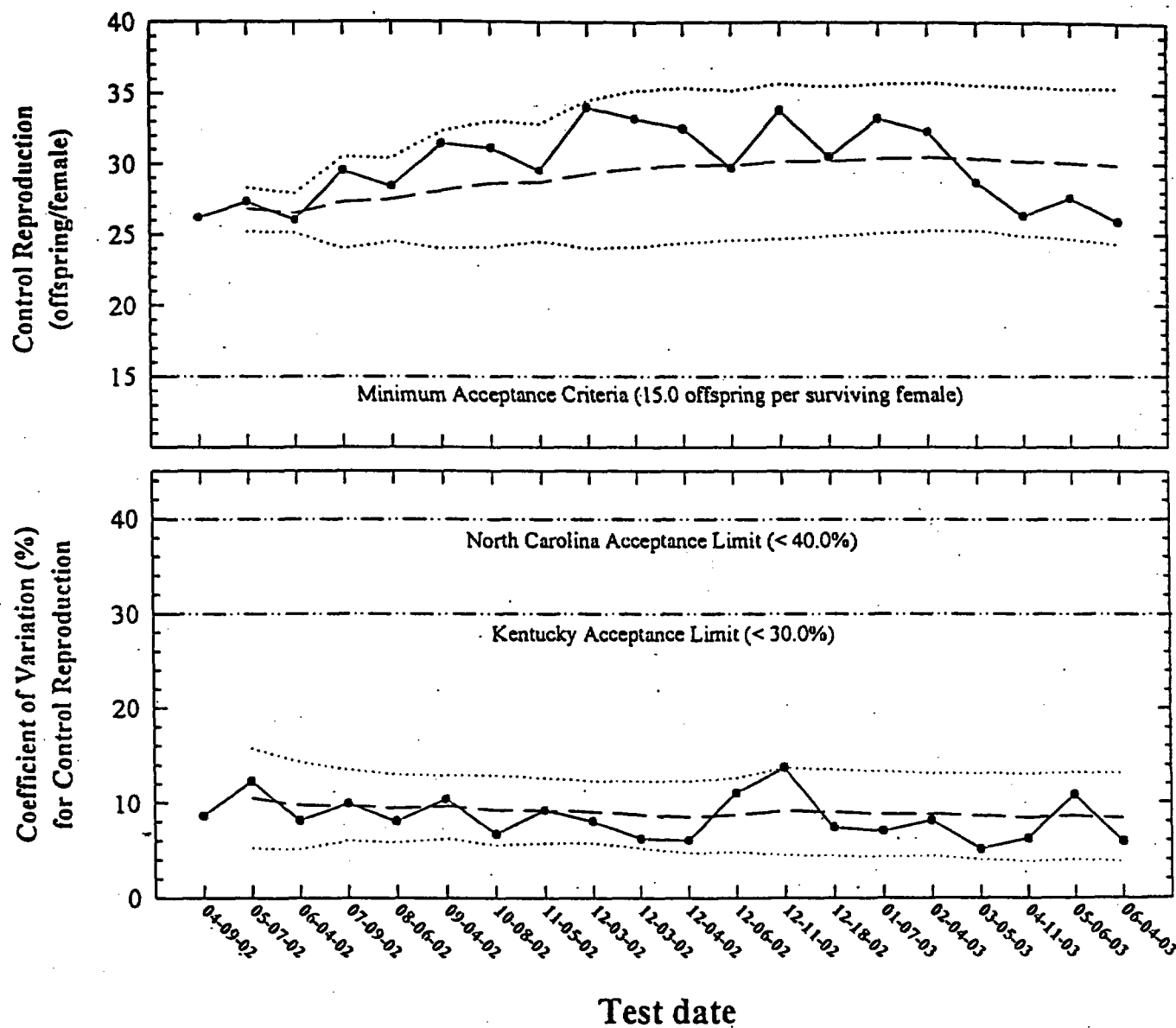
CT = Central Tendency (Mean Control Reproduction, CV, or PMSD)

The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

# Environmental Testing Solutions, LLC

## *Ceriodaphnia dubia* Control Reproduction and Coefficient of Variation in Sodium Chloride Chronic Reference Toxicant Tests

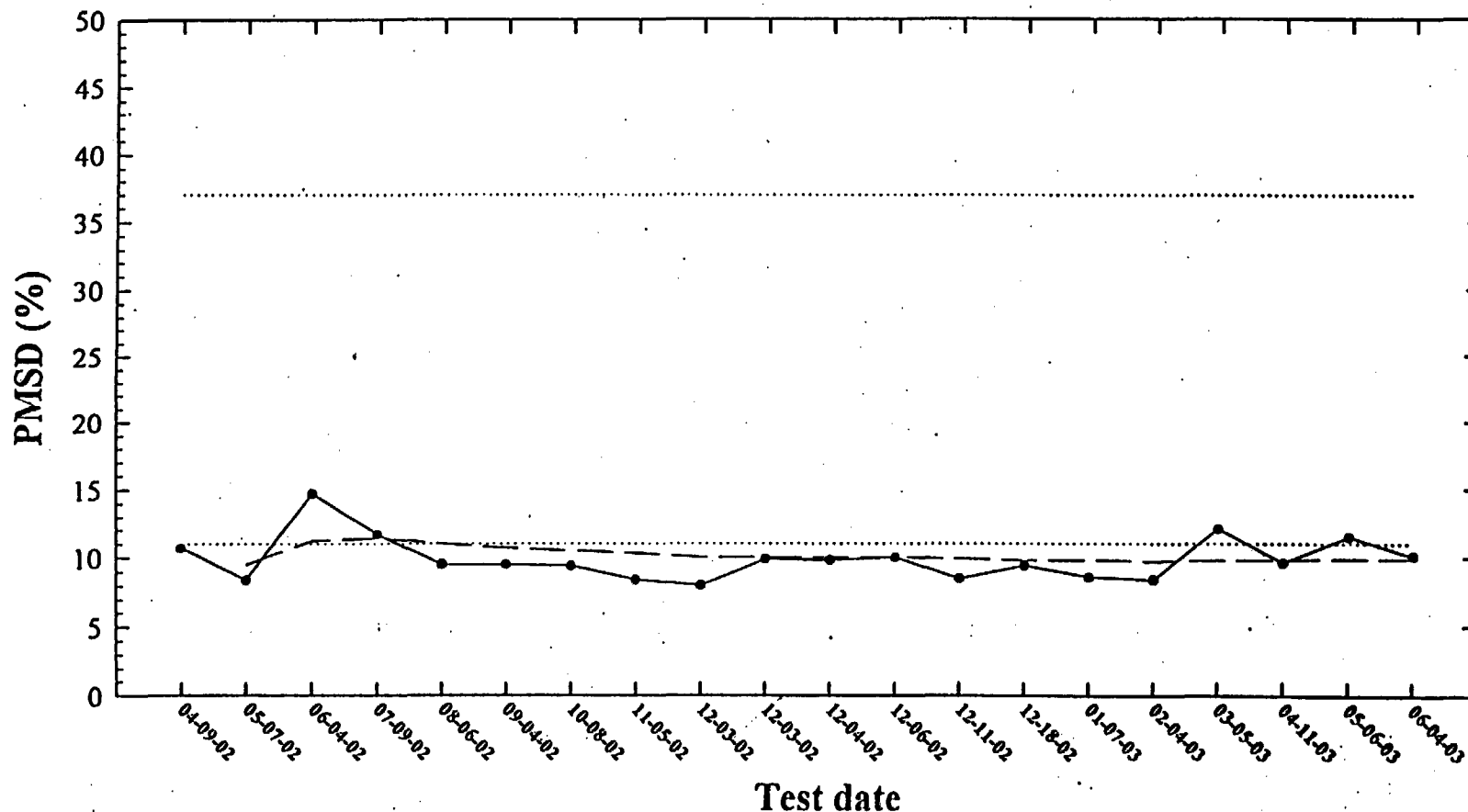


- Control Reproduction or Coefficient of Variation (CV)
- Central Tendency (mean Control Reproduction or CV)
- ..... Control Limits (mean Control Reproduction or CV  $\pm 2$  Standard Deviations)

# Environmental Testing Solutions, LLC

## Precision of Endpoint Measurements

Sodium Chloride Chronic Reference Toxicant Control Chart  
for *Ceriodaphnia dubia*  
using Moderately Hard Synthetic Water



—●— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.  
— - Central Tendency (mean PMSD)  
..... Lower and Upper PMSD Bounds  
Lower PMSD Bound (10<sup>th</sup> percentile) = 11%, Upper PMSD Bound (90<sup>th</sup> percentile) = 37%  
(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

**Sodium Chloride Chronic Reference Toxicant Test**  
**(EPA-821-R-02-013 Method 1002.0)**  
**Species: *Ceriodaphnia dubia***

CdNaCLCR #: 11

Dilution preparation information:						Comments:
NaCl CHM number:		CHM 060				
Stock preparation:		100 g NaCl (dissolve 50 g NaCl in 500 ml deionized water)				
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		Test information:	
Organism age:	< 24-HOURS OLD	Randomizing template:	BWE
Date and times organisms were born between:	<del>06-03-03 1458 TO 1734</del> 06-04-03 0811 TO 1020	Incubator number and shelf location:	B1
Organism source:	05-27-03 A-D	YCT batch:	ABS 05-23-03
Transfer bowl information:	pH = 8.03 Temperature = 24.9	Selenastrum batch:	PES 05-23-03

## Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHS	Analyst
0	06-04-03	1310	06-03-03	JF
1	06-05-03	1300	06-04-03	JF
2	06-06-03	1311	06-05-03	JF
* 3	06-07-03	0916	06-06-03	JF
* 4	06-08-03	1926	06-07-03	JF
5	06-09-03	1322	06-08-03	JF
6	06-10-03	1300	06-09-03	JF
7	06-11-03	1253	— JF	JF

\* test was not renewed within 1-hour of initiation due to a scheduling conflict.

Control information:		Acceptance criteria	Summary of test endpoints:	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 1400
% Adults having 3 <sup>rd</sup> Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	25.9	≥ 15.0 offspring/female	ChV	894.4
% CV:	5.9%	< 40.0 %	IC25	1068.6

Species: *Ceriodaphnia dubia*CdNaCLCR #: 11

## CONTROL

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	3	4	4	4	3	4	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	11	11	12	10	10	11	8	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	11	12	11	11	11	14	13	14	10	12
Total young produced		23	26	26	27	25	27	28	27	24	26
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3 <sup>rd</sup> Broods		X	X	X	X	X	X	X	X	X	X

Concentration:

% Mortality:

0%

Mean Offspring/Female:

259

## 600 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	4	4	4	3	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	12	10	8	10	10	11	10	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	10	10	12	11	14	10	11	11	13
Total young produced		32	27	24	24	25	27	25	25	27	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:

% Mortality:

0%

Mean Offspring/Female:

263

% Reduction from Control:

-15%

Species: *Ceriodaphnia dubia*CdNaCLCR #: 11

800 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	3	3	5	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	10	7	12	10	11	11	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	10	10	13	11	15	10	12	12	10	9
Total young produced		25	24	27	21	30	25	27	26	27	23
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	25.6
% Reduction from Control:	1.2%

1000 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	3	3	4	4	2	3	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	10	10	8	10	9	12	9	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	10	8	13	10	12	10	10	10	11	14
Total young produced		24	22	26	24	24	22	22	26	24	25
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	23.9
% Reduction from Control:	7.7

Species: *Ceriodaphnia dubia*CdNaCLCR #: 11

1200 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	2	0	4	4	0	3	3	4	2	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	4	7	10	3	8	0	10	10	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	4	1	0	0	0	0	8	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	3	0	5	2	1	0	0	5
Total young produced		6	5	14	14	8	13	12	14	12	15
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	11.3
% Reduction from Control:	56.4%

1400 mg NaCl/L

## Survival and Reproduction Data

Day		Replicate number									
		1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	1	3	2	3	2	3	2	4	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	0	6	0	5	6	1	5	0	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	2	2	7	1	0	0	3	6	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	3	0	0	0	0
Total young produced		5	5	10	10	8	12	3	12	9	10
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

## Concentration:

% Mortality:	0%
Mean Offspring/Female:	8.4
% Reduction from Control:	67.1%

# Environmental Testing Solutions, LLC

## Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0) Species: *Ceriodaphnia dubia*

### Quality Control Verification of Data Entry, Calculations, and Statistical Analyses

Test number: CdNaClCR #40  
Test dates: June 4-11, 2003

Reviewed by: *J. Humre*

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	23	26	26	27	25	27	28	27	24	26	100	25.9	5.9	Not applicable
600	32	27	24	24	25	27	25	25	27	27	100	26.3	9.0	-1.5
800	25	24	27	21	30	25	27	27	27	23	100	25.6	10.0	1.2
1000	24	22	26	24	24	22	22	26	24	25	100	23.9	6.4	7.7
1200	6	5	14	14	8	13	12	14	12	15	100	11.3	32.1	56.4
1400	5	5	10	10	8	12	3	12	9	10	100	8.4	36.9	67.6

Dunnnett's MSD value: 2.621  
PMSD: 10.1

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.9% from the control.

Lower PMSD bound determined by USEPA (10<sup>th</sup> percentile) = 11%.

Upper PMSD bound determined by USEPA (90<sup>th</sup> percentile) = 37%.

The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.



# Environmental Testing Solutions, LLC

## Verification of *Ceriodaphnia* Reproduction Totals

### Control

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	3	4	4	4	3	4	5	4	4	38
5	9	11	11	12	10	10	11	8	10	10	102
6	0	0	0	0	0	0	0	0	0	0	0
7	11	12	11	11	11	14	13	14	10	12	119
Total	23	26	26	27	25	27	28	27	24	26	259

### 1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	3	3	4	4	2	3	4	4	4	35
5	10	11	10	10	8	10	9	12	9	7	96
6	0	0	0	0	0	0	0	0	0	0	0
7	10	8	13	10	12	10	10	10	11	14	108
Total	24	22	26	24	24	22	22	26	24	25	239

### 600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	4	4	4	3	4	4	4	4	40
5	13	12	10	8	10	10	11	10	12	10	106
6	0	0	0	0	0	0	0	0	0	0	0
7	15	10	10	12	11	14	10	11	11	13	117
Total	32	27	24	24	25	27	25	25	27	27	263

### 1200 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	2	0	4	4	0	3	3	4	2	4	26
5	0	4	7	10	3	8	0	10	10	6	58
6	4	1	0	0	0	0	8	0	0	0	13
7	0	0	3	0	5	2	1	0	0	5	16
Total	6	5	14	14	8	13	12	14	12	15	113

### 800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	3	3	5	4	4	4	4	40
5	10	10	10	7	12	10	11	11	13	10	104
6	0	0	0	0	0	0	0	0	0	0	0
7	10	10	13	11	15	10	12	12	10	9	112
Total	25	24	27	21	30	25	27	27	27	23	256

### 1400 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	1	3	2	3	2	3	2	4	3	3	26
5	4	0	6	0	5	6	1	5	0	7	34
6	0	2	2	7	1	0	0	3	6	0	21
7	0	0	0	0	0	3	0	0	0	0	3
Total	5	5	10	10	8	12	3	12	9	10	84

# Environmental Testing Solutions, LLC

## Statistical Analyses

Ceratophyllus Survival and Reproduction Test-Replication				
Start Date: 6/4/03	Test ID: CAN-CCR	Sample ID:	REF-Ref Toxicant:	
End Date: 6/11/03	Lab ID: ETS-Env. Testing Solutions	Sample Type:	NaCl-Sodium chloride	
Sample Date	Protocol: CHRONIC(EPA-821-R-02-013)	Test Species:	CD-Ceratophyllus dubia	
Comments:				

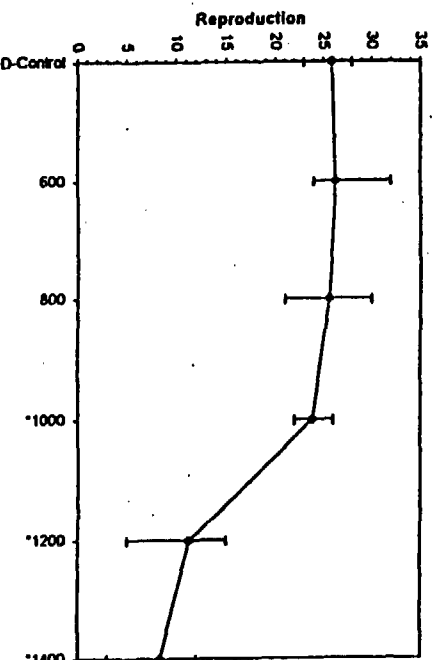
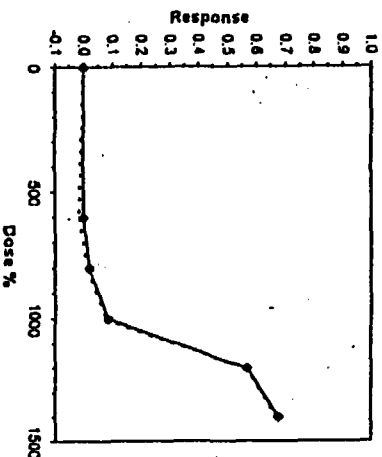
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	21,000	26,000	26,000	27,000	25,000	27,000	28,000	27,000	24,000	26,000
600	32,000	27,000	24,000	24,000	25,000	27,000	25,000	23,000	27,000	27,000
800	25,000	24,000	27,000	21,000	30,000	25,000	27,000	27,000	27,000	21,000
1000	24,000	22,000	26,000	24,000	24,000	22,000	26,000	24,000	24,000	25,000
1200	6,000	5,000	14,000	14,000	8,000	13,000	12,000	14,000	12,000	15,000
1400	5,000	5,000	10,000	10,000	8,000	12,000	3,000	12,000	9,000	10,000

Conc-%	Mean	N-Mean	Transform: Untransformed					Rank	Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	23,900	1,0000	23,900	23,000	23,000	3.884	10	105.50	75.00	75.00	26,100	1,0000
600	26,300	1,0154	26,300	24,000	32,000	8.971	10	102.00	75.00	75.00	25,600	0.9808
800	25,600	0.9884	25,600	21,000	30,000	9.931	10	72.50	75.00	75.00	23,900	0.9137
1000	23,900	0.9728	23,900	22,000	26,000	6.376	10	55.00	75.00	75.00	11,300	0.4330
1200	11,300	0.4363	11,300	5,000	15,000	32.037	10	55.00	75.00	75.00	8,400	0.3718
1400	8,400	0.3743	8,400	3,000	12,000	36.886	10	55.00	75.00	75.00		

Auxiliary Tests		Statistic		Critical		Skew		Kurt	
Kolmogorov D Test indicates non-normal distribution ( $p < 0.01$ )		1.0423182		1.035		-0.4006381		0.21968436	
Bartlett's Test indicates equal variances ( $p = 0.07$ )		10.2440815		13.0863171					
Hypothesis Test (1-tail, 8.05)		NOEC		LOEC		CHV		TU	
Sheff's Many-One Rank Test		800		1000		894.427191		0.125	
Treatments vs D-Control									

Poiet	%	SD	95% CL	Skew
IC03	894.703882	80.1969472	704.731793 1005.38276	-1.0173
IC10	1006.50794	27.9708697	909.763158 1023.00205	-2.2883
IC15	1027.22222	8.67486762	1007.94967 1043.98612	0.0354
IC20	1047.93651	8.5336821	1029.73966 1065.08412	0.1385
IC25	1068.65079	8.840911	1050.73864 1087.31222	0.1755
IC40	1130.79363	11.8651207	1108.8382 1154.33188	0.1560
IC50	1172.22222	13.6686963	1146.73334 1199.37609	0.3500

Linear Interpolation (200 Resamples)



# Environmental Testing Solutions, LLC

## Statistical Analyses

Used for PMSD calculation only.			Ceriodaphnia Survival and Reproduction Test-Reproduction								
Start Date: 6/4/03	Test ID:	CdNaClCR				Sample ID:	REF-Ref Toxicant				
End Date: 6/11/03	Lab ID:	ETS-Env. Testing Solutions				Sample Type:	NACL-Sodium chloride				
Sample Date	Protocol:	CHRONIC-(EPA-821-R-02-013)				Test Species:	CD-Ceriodaphnia dubia				
Comments:											
Conc-%	1	2	3	4	5	6	7	8	9	10	
D-Control	23.000	26.000	26.000	27.000	25.000	27.000	28.000	27.000	24.000	26.000	
600	32.000	27.000	24.000	24.000	25.000	27.000	25.000	25.000	27.000	27.000	
800	25.000	24.000	27.000	21.000	30.000	25.000	27.000	27.000	27.000	23.000	
1000	24.000	22.000	26.000	24.000	24.000	22.000	22.000	26.000	24.000	25.000	
1200	6.000	5.000	14.000	14.000	8.000	13.000	12.000	14.000	12.000	15.000	
1400	5.000	5.000	10.000	10.000	8.000	12.000	3.000	12.000	9.000	10.000	

Transform: Untransformed											
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	1-Tailed Critical	MSD	
D-Control	25.900	1.0000	25.900	23.000	28.000	5.884	10				
600	26.300	1.0154	26.300	24.000	32.000	8.971	10	-0.349	2.287	2.621	
800	25.600	0.9884	25.600	21.000	30.000	9.951	10	0.262	2.287	2.621	
1000	23.900	0.9228	23.900	22.000	26.000	6.376	10	1.745	2.287	2.621	
*1200	11.300	0.4363	11.300	5.000	15.000	32.057	10	12.736	2.287	2.621	
*1400	8.400	0.3243	8.400	3.000	12.000	36.886	10	15.266	2.287	2.621	

Auxiliary Tests											
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)							Statistic	Critical	Skew	Kurt	
Bartlett's Test indicates equal variances (p = 0.07)							10.2440815	15.0863171	-0.40063805	0.21968436	
Hypothesis Test (1-tail, 0.05)											
	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df	
Dunnett's Test	1000	1200	1095.44512	0.1	2.62127616	0.10120757	661.986667	6.57037037	4.1E-26	5, 54	
Treatments vs D-Control											

Species: *Ceriodaphnia dubia*CdNaCLCR #: 11

## Daily Chemistry:

Concentration	Parameter	Day					
		0		1		2	
CONTROL	pH (S.U.)	7.79	7.76	7.74	7.84	7.82	7.85
	DO (mg/L)	7.8	7.7	8.2	7.6	7.7	7.8
	Conductivity (µmhos/cm)	313		311		291	
	Alkalinity (mg CaCO <sub>3</sub> /L)	59		—		—	
	Hardness (mg CaCO <sub>3</sub> /L)	86		—		—	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
600 mg NaCl/L	pH (S.U.)	7.78	7.77	7.77	7.89	7.83	7.88
	DO (mg/L)	8.3	7.7	8.0	7.8	8.1	7.8
	Conductivity (µmhos/cm)	1440		1432		1401	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
800 mg NaCl/L	pH (S.U.)	7.80	7.79	7.78	7.90	7.84	7.89
	DO (mg/L)	8.1	7.8	8.2	8.0	8.0	7.8
	Conductivity (µmhos/cm)	1797		1802		1774	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
1000 mg NaCl/L	pH (S.U.)	7.78	7.81	7.79	7.88	7.84	7.91
	DO (mg/L)	8.0	7.8	8.2	7.8	8.1	7.8
	Conductivity (µmhos/cm)	2163		2173		1774	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
1200 mg NaCl/L	pH (S.U.)	7.80	7.80	7.80	7.88	7.85	7.91
	DO (mg/L)	8.1	7.8	8.2	7.8	8.2	7.8
	Conductivity (µmhos/cm)	2513		2509		2451	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
1400 mg NaCl/L	pH (S.U.)	7.80	7.80	7.80	7.88	7.85	7.92
	DO (mg/L)	8.4	7.8	8.4	8.0	8.2	7.8
	Conductivity (µmhos/cm)	2812		2825		2760	
	Temperature (°C)	25.0	24.5	24.8	24.5	25.3	24.6
		Initial	Final	Initial	Final	Initial	Final

stock

76000

Species: *Ceriodaphnia dubia*CdNaCLCR #: 11

Concentration	Parameter	Day							
		3		4		5		6	
CONTROL	pH (S.U.)	7.80	7.78	7.82	8.14	7.75	8.10	7.78	7.86
	DO (mg/L)	7.7	7.8	7.7	7.7	7.8	8.0	7.8	8.2
	Conductivity (µmhos/cm)	296		300		308		311	
	Alkalinity (mg CaCO <sub>3</sub> /L)	—		—		—		—	
	Hardness (mg CaCO <sub>3</sub> /L)	—		—		—		—	
	Temperature (°C)	25.1	24.7	25.0	24.8	25.2	24.4	25.1	24.3
600 mg NaCl/L	pH (S.U.)	7.81	7.78	7.83	8.33	7.93	8.10	7.83	7.96
	DO (mg/L)	7.7	7.8	7.8	7.7	7.8	7.9	7.8	8.2
	Conductivity (µmhos/cm)	1409		1400		1392		1400	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
800 mg NaCl/L	pH (S.U.)	7.81	7.79	7.83	8.34	7.93	8.11	7.83	7.95
	DO (mg/L)	7.8	7.8	7.8	7.7	7.8	7.9	7.8	8.2
	Conductivity (µmhos/cm)	1776		1770		1755		1760	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
1000 mg NaCl/L	pH (S.U.)	7.81	7.79	7.83	8.36	7.96	8.11	7.85	7.94
	DO (mg/L)	7.8	7.8	7.8	7.7	7.8	7.9	7.8	8.2
	Conductivity (µmhos/cm)	2050		2040		2101		2100	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
1200 mg NaCl/L	pH (S.U.)	7.82	7.79	7.83	8.38	7.94	8.11	7.85	7.93
	DO (mg/L)	7.8	7.8	7.8	7.7	7.6	7.9	7.8	8.2
	Conductivity (µmhos/cm)	2470		2460		2444		2440	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
1400 mg NaCl/L	pH (S.U.)	7.82	7.79	7.84	8.36	7.96	8.11	7.85	7.93
	DO (mg/L)	7.8	7.8	7.8	7.7	7.6	7.9	7.8	8.1
	Conductivity (µmhos/cm)	2800		2770		2757		2760	
	Temperature (°C)	25.1	24.6	25.0	24.8	25.2	24.4	25.1	24.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
 Name TVA - SEQUOYAH NUCLEAR PLANT  
 Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
 Facility TVA - SEQUOYAH NUCLEAR PLANT  
 Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
 DISCHARGE MONITORING REPORT (DMR)

MAJOR (SUBR 01)  
 F - FINAL  
 LOW VOL. WASTE TREATMENT POND  
 EFFLUENT

Form Approved.  
 OMB No. 2040-0004

TN0026450 103 G  
 PERMIT NUMBER DISCHARGE NUMBER  
 MONITORING PERIOD  
 YEAR MO DAY YEAR MO DAY  
 From 03 06 01 To 03 06 30

ATTN: Stephanie A. Howard

\*\*\* NO DISCHARGE ☐ \*\*\*

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.2	*****	8.9	12	0	12 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	**	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	113	140	26	*****	10	12	19	0	4 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<57	<61	26	*****	<5	<5	19	0	4 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.232	1.453	03	*****	*****	*****	**	0	30 / 30	TOTAL
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	**		DAILY	TOTAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	03	07	14
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
Name TVA - SEQUOYAH NUCLEAR PLANT  
Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
Facility TVA - SEQUOYAH NUCLEAR PLANT  
Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
DISCHARGE MONITORING REPORT (DMR)

MAJOR (SUBR 01)  
F - FINAL  
METAL CLEANING WASTE POND  
EFFLUENT

Form Approved.  
OMB No. 2040-0004

TN0026450 107 G  
PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
From 03	06	01	To 03	06	30

\*\*\* NO DISCHARGE ☒ \*\*\*

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**		*****		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		DAILY	GRAB
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		19			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	*****	*****	*****	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	***		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	<i>Stephanie A. Howard</i> Acting Environmental Supervisor	TELEPHONE		DATE		
Richard T. Purcell Site Vice President			423	843-6700	03	07	14
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)  
No phosphorous bearing cleaning solutions were used. No Discharge this Period

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
Name TVA - SEQUOYAH NUCLEAR PLANT  
Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
Facility TVA - SEQUOYAH NUCLEAR PLANT  
Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
DISCHARGE MONITORING REPORT (DMR)

MAJOR  
(SUBR 01)  
F - FINAL  
RECYCLED COOLING WATER  
EFFLUENT

Form Approved.  
OMB No. 2040-0004

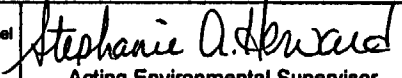
TN0026450			110 G		
PERMIT NUMBER			DISCHARGE NUMBER		
MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
03	06	01	03	06	30

ATTN: Stephanie A. Howard

\*\*\* NO DISCHARGE ☒ \*\*\*

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**		*****		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**		*****		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**		*****		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	15 DAILY MX	MG/L		DAILY	COMPOS
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	*****	*****	**		*****		19			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	*****	*****	**		*****		19			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	*****	*****	**		*****		19			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	***	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03		*****	*****	*****	**		
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	*****	***	DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	 Acting Environmental Supervisor	TELEPHONE		DATE		
Richard T. Purcell Site Vice President			423	843-6700	03	07	14
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

No Discharge this Period



PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
Name TVA - SEQUOYAH NUCLEAR PLANT  
Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
Facility TVA - SEQUOYAH NUCLEAR PLANT  
Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
DISCHARGE MONITORING REPORT (DMR)

MAJOR (SUBR 01)  
F - FINAL  
BACKWASH  
EFFLUENT

Form Approved.  
OMB No. 2040-0004

TN0026450 116 G  
PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD  
From YEAR MO DAY To YEAR MO DAY  
03 06 01 03 06 30

NO DISCHARGE

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0	9A	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	*****	0	94	*****	*****	*****	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT MO TOTAL	YES=1 NO=0	*****	*****	*****	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	03	07	14
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT						

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)  
Operations performs visual inspections for floating debris and oil and grease during all backwashes.

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
Name TVA - SEQUOYAH NUCLEAR PLANT  
Address P.O. BOX 2000  
(INTEROFFICE SB-2A)  
SODDY - DAISY TN 37384  
Facility TVA - SEQUOYAH NUCLEAR PLANT  
Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
DISCHARGE MONITORING REPORT (DMR)

MAJOR  
(SUBR 01)  
F - FINAL  
BACKWASH  
EFFLUENT

Form Approved.  
OMB No. 2040-0004

TN0026450 117 G  
PERMIT NUMBER DISCHARGE NUMBER

MONITORING PERIOD  
From YEAR MO DAY To YEAR MO DAY  
03 06 01 03 06 30

\*\*\* NO DISCHARGE ☐ \*\*\*

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0	9A	0	1 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	*****	0	94	*****	*****	*****	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	REPORT MO TOTAL	YES=1 NO=0	*****	*****	*****	***		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	03	07	14
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)  
Operations performs visual inspections for floating debris and oil and grease during all backwashes.

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)  
 Name **TVA - SEQUOYAH NUCLEAR PLANT**  
 Address **P.O. BOX 2000**  
 (INTEROFFICE SB-2A)  
 SODDY - DAISY TN 37384  
 Facility **TVA - SEQUOYAH NUCLEAR PLANT**  
 Location **HAMILTON COUNTY**

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
 DISCHARGE MONITORING REPORT (DMR)  
 TN0026450  
 PERMIT NUMBER  
 118 G  
 DISCHARGE NUMBER

MAJOR  
 (SUBR 01)  
 F - FINAL  
 WASTEWATER & STORM WATER  
 EFFLUENT

Form Approved.  
 OMB No. 2040-0004

ATTN: Stephanie A. Howard

MONITORING PERIOD  
 From 

YEAR	MO	DAY
03	06	01

 To 

YEAR	MO	DAY
03	06	30

\*\*\* NO DISCHARGE ☒ \*\*\*

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
OXYGEN, DISSOLVED (DO)	SAMPLE MEASUREMENT	*****	*****	**		*****	*****	19			
00300 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	2.0 DAILY MN	*****	*****	MG/L		TWICE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**		*****		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****		*****	100 DAILY MX	MG/L		TWICE/ WEEK	GRAB
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	*****	*****	**		*****		25			
00545 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****		*****	1.0 DAILY MX	ML/L		ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03		*****	*****	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD		*****	*****	*		ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	03	07	14
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)  
 During this reporting period, there has been no flow from the Dredge Pond other than that resulting from rainfall.