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

September 10, 2003

State of Tennessee
Department of Environment and Conservation
Division of Water Pollution Control
Enforcement & Compliance Section
6th 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 AUGUST 2003

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

Sincerely,

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

IE25

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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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	29.2	04	0	31 / 31	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	42.9	04	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	7.4	12	0	8 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	6	6	19	0	4 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	4 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1589	03	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.010	0.020	19	0	38 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.036	0.058 INST MAX	MG/L		WEEK-DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	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.	Stephanie A. Howard Acting Environmental Supervisor	423	843-6700	03	09	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following injections occured: 1. PCL-222 (max. calc. conc. was 0.064mg/L--limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0.009mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.022mg/L--limit 0.100mg/L) 4. H-130M (max. calc. conc. was 0.025mg/L--limit 0.050mg/L) 5. H-130M (low detection level analytical method was 0.047mg/L--limit 0.050mg/L))

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Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.2	62	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG C /HR		CONTIN-UOUS	CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	1.8	04	0	31 / 31	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0	DEG. C.		CONTIN UOUS	CALCTD
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.2	<0.2	<0.2	19	0	1 / 31	GRAB
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	REPORT	REPORT	REPORT	MG/L		ONCE/ MONTH	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

CCW data for August 2003 is attached.

CCW CHANNEL

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
08/04/2003 1010	< 0.5 mg/L	08/08/2003 2110	JBR	EPA 8015B
08/29/2003 0710	< 0.5 mg/L	09/03/2003 1118	JBR	EPA 8015B

CCW TRENCH

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
08/04/2003 1000	< 0.5 mg/L	08/08/2003 2148	JBR	EPA 8015B
08/29/2003 0715	1.3 mg/L	09/03/2003 1156	JBR	EPA 8015B

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Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

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

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE [ ] ***

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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 MIMINUM	********	********	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			TELEPHONE		DATE		
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TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
Toxicity was sampled from August 3-8, 2003. Report is attached.

September 8, 2003

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, H130M SPECIAL STUDY, AUGUST, 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 August 3-8 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

Cynthia L. Russell
Biologist
Environmental Engineering Services- West
CEB 3A-M

Attachment
cc (Attachment):
Files, ER&TA, CEB 1B-M

SQN H130M-August 2003m

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: September 8, 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: August 3-8, 2003
10. Average Flow on Days Sampled (MGD): 1570.5, 1579.0, 1578.5
11. Pertinent Site Conditions:

    H130M was being injected from August 5-7, 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.

Injection Location	Date/Start Time (EDT)	Date/Ending Time (EDT)
Essential Raw Cooling Water (ERCW)-A Train	August 5, 2003/1005	August 6, 2003/1004
Raw Cooling Water (RCW)	August 6, 2003/1250	August 7, 2003/1249

12. Test Dates: August 5-12, 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: $IC_{25} = 43.9\%$

17. Test Results: Outfall 101: *Pimephales promelas:* $IC_{25} > 100$
Ceriodaphnia dubia: $IC_{25} > 100$

UV treated Outfall 101: *Pimephales promelas:* $IC_{25} > 100$

18. Facility Contact: Ann Hurt
Phone #: (423) 843-6714

19. Consulting / Testing Lab: Environmental Testing Solutions, Inc.

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 August 3-8, 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.

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	08/03/03 1318 to 08/04/03 1218	08/05/03/ 1016	0.9†	<0.10	08/05/03 1433 08/06/03 1350
Intake	08/03/03 1300 to 08/04/03 1200	08/05/03/ 1016	0.9	<0.10	08/05/03 1433 08/06/03 1350
101	08/05/03 1349 to 08/06/03 1249	08/07/03/ 1800‡	0.6†	<0.10	08/07/03 1845 08/08/03 1440
Intake	08/05/03 1325 to 08/06/03 1225	08/07/03/ 0946	0.5	<0.10	08/07/03 1845 08/08/03 1440
101	08/07/03 1440 to 08/08/03 1340	08/09/03/ 0940	1.2†	<0.10	08/09/03 1409 08/10/03 1416 08/11/03 1420
Intake	08/07/03 1450 to 08/08/03 1350	08/09/03/ 0940	1.3	<0.10	08/09/03 1409 08/10/03 1416 08/11/03 1420

*TRC = Total Residual Chlorine
†Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival.
‡Sample arrived late due to shipping difficulties. The EPA's maximum allowed holding time of 36 hours for sample's first use was not exceeded.

4. Sample Manipulation: Samples collected from Outfall 101 and 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 Smart® UV Sterilizer (manufactured by Emperor Aquatics, Inc.) for 2 minutes.

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatic BioSystems, Inc.	In-house Cultures
2. Age:	23-25.5 -hours old	< 24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	08/05/03-1433 EDT	08/05/03-1337 EDT
UV Treated Outfall 101	08/05/03-1422 EDT	
7. Test Termination: (Date/Time)		
Outfall 101	08/12/03-1416 EDT	08/12/03-1243 EDT
UV Treated Outfall 101	08/12/03-1350 EDT	
8. Test Temperature: Outfall 101:	Mean =25.1°C (24.7-25.6°C)	Mean = 25.2°C (25.0-25.5°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 25.3°C (24.9-25.6°C)	

9. Physical / Chemical Measurements: 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.

10. Statistics: Statistics were performed according to methods prescribed by EPA using ToxCalc version 5.0 statistical software (Tidepool Scientific Software, McKinneyville, CA).

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 August 5-12, 2003 using effluent collected 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	98	98	98
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	1.093	0.962	0.964	1.046	1.016
10.98%	0.998	1.054	0.950	1.015	1.004
22%	0.895	0.969	1.095	1.131	1.023
43.9%	1.046	0.930	0.962	0.865	0.951
72%	0.944	1.035	1.218	0.893	1.023
100%	1.175	0.986	0.884	1.114	1.040
Intake	1.018	0.998	1.110	1.180	1.077

IC_{25} Value: > 100% Permit Limit: 43.9	Calculated TU Estimates: < 1.0 TUc*
95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Permit Limit: 2.3 TUc

*TUa = 100/LC_{50}: TUc = 100/ IC_{25}

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 August 5-12, 2003 using effluent collected 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

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	33	30	33	36	30	31	36	29	28	34	32.0
10.98%	36	35	31	31	30	34	35	32	33	32	32.9
22%	35	33	35	33	32	33	38	35	32	36	34.2
43.9%	29	36	33	35	32	37	31	31	32	36	33.2
72%	33	37	34	37	36	29	35	36	31	39	34.7
100%	36	35	36	31	37	37	32	36	36	36	35.2

IC_{25} Value: > 100% Permit Limit: 43.9 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.3 TUc

*TUa = 100/LC_{50}: TUc = 100/ IC_{25}

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 August 5-12, 2003 using water collected from Intake.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	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	33	35	32	26	32	36	32	32	32	30	32.0
Intake	31	34	33	34	31	32	32	30	30	32	31.9

No significant difference based on Homoscedastic t-Test

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 August 5-12, 2003 using effluent collected from Outfall 101(UV treated).

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)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.929	0.913	0.943	0.841	0.906
10.98%	1.090	1.126	1.043	1.005	1.066
22%	0.937	1.043	0.972	0.999	0.988
43.9%	1.011	1.079	0.899	1.145	1.034
72%	1.227	1.196	1.039	1.031	1.123
100%	1.090	1.121	1.266	1.018	1.124
Intake	1.191	0.928	1.092	1.030	1.060

IC_{25} Value: > 100%	Calculated TU Estimates: < 1.0 TUc*
95% Confidence Limits: NA Upper Limit: NA Lower Limit: NA	Permit Limit: NA

*TUa = 100/LC_{50}: TUc = 100/ IC_{25}

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	August 5, 2003	1215	7-days	KCl	532.5 mg/L
Ceriodaphnia dubia	August 5, 2003	1354	7-days	NaCl	1036.3 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, August 5-12, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	25.3 25.1 - 25.5	24.9 24.7 - 25.6	7.7 7.5 - 7.9	7.5 7.3 - 7.8	7.67 7.39 - 8.04	7.60 7.41 - 7.89	311 302 - 321	60.0 59 - 61	86.0 84 - 88	- - -
	10.98%	25.3 25.1 - 25.5	24.9 24.7 - 25.6	7.8 7.6 - 8.2	7.5 7.2 - 7.8	7.63 7.38 - 8.01	7.56 7.37 - 7.87	297 282 - 309	- - -	- - -	- - -
	22%	25.4 25.2 - 25.5	24.9 24.7 - 25.6	7.8 7.6 - 8.2	7.4 7.0 - 7.7	7.63 7.37 - 8.01	7.55 7.34 - 7.86	287 276 - 295	- - -	- - -	- - -
	43.9%	25.4 25.2 - 25.5	24.9 24.7 - 25.6	7.8 7.6 - 8.2	7.4 7.0 - 7.7	7.59 7.31 - 8.00	7.53 7.31 - 7.83	259 251 - 266	- - -	- - -	- - -
	72%	25.4 25.3 - 25.5	24.9 24.7 - 25.6	7.8 7.6 - 8.2	7.4 7.0 - 7.7	7.55 7.25 - 7.99	7.53 7.31 - 7.85	221 215 - 227	- - -	- - -	- - -
	100%	25.4 25.3 - 25.5	24.9 24.7 - 25.6	7.9 7.7 - 8.2	7.4 7.0 - 7.7	7.51 7.16 - 7.98	7.54 7.28 - 7.90	184 180 - 191	63.0 61 - 65	74.7 74 - 76	< 0.10 < 0.10 - < 0.10
	Intake	25.3 25.1 - 25.5	24.9 24.7 - 25.6	7.9 7.7 - 8.2	7.4 7.1 - 7.8	7.54 7.42 - 7.97	7.55 7.35 - 7.90	180 174 - 185	62.0 61 - 63	75.3 72 - 78	< 0.10 < 0.10 - < 0.10
Ceriodaphnia dubia	Control	25.3 25.1 - 25.5	25.1 25.0 - 25.3	7.7 7.5 - 7.9	7.8 7.5 - 8.0	7.67 7.39 - 8.04	7.70 7.50 - 7.97	311 302 - 321	60.0 59 - 61	86.0 84 - 88	- - -
	10.98%	25.3 25.1 - 25.5	25.1 25.0 - 25.3	7.8 7.6 - 8.2	7.8 7.6 - 8.0	7.63 7.38 - 8.01	7.70 7.49 - 7.98	297 282 - 309	- - -	- - -	- - -
	22%	25.3 25.1 - 25.5	25.1 25.0 - 25.3	7.8 7.6 - 8.2	7.8 7.6 - 8.0	7.63 7.37 - 8.01	7.70 7.49 - 7.96	287 276 - 295	- - -	- - -	- - -
	43.9%	25.3 25.2 - 25.5	25.1 25.0 - 25.3	7.8 7.6 - 8.2	7.8 7.5 - 8.0	7.59 7.31 - 8.00	7.70 7.51 - 7.97	259 251 - 266	- - -	- - -	- - -
	72%	25.3 25.2 - 25.5	25.1 25.0 - 25.3	7.8 7.6 - 8.2	7.8 7.5 - 8.0	7.55 7.25 - 7.99	7.72 7.51 - 7.98	221 215 - 227	- - -	- - -	- - -
	100%	25.3 25.2 - 25.5	25.1 25.0 - 25.3	7.9 7.7 - 8.2	7.8 7.5 - 8.0	7.51 7.16 - 7.98	7.73 7.52 - 7.98	184 180 - 191	63.0 61 - 65	74.7 74 - 76	< 0.10 < 0.10 - < 0.10
	Intake	25.3 25.2 - 25.5	25.1 25.0 - 25.3	7.9 7.7 - 8.2	7.8 7.5 - 8.0	7.54 7.42 - 7.97	7.70 7.52 - 8.01	180 174 - 185	62.0 61 - 63	75.3 72 - 78	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	25.1	24.7	25.6
Ceriodaphnia dubia	25.2	25.0	25.5

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, August 5-12, 2003.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)
		Initial	Final	Initial	Final	Initial	Final	
Pimephales promelas	Control	25.4 24.9 - 25.6	25.2 25.0 - 25.5	7.8 7.7 - 8.0	7.5 7.2 - 7.8	7.63 7.50 - 7.97	7.57 7.35 - 7.88	303 292 - 314
	10.98%	25.4 25.1 - 25.6	25.2 25.0 - 25.5	7.8 7.6 - 8.0	7.4 7.0 - 7.7	7.64 7.50 - 7.97	7.55 7.30 - 7.85	297 286 - 305
	22%	25.4 25.1 - 25.6	25.2 25.0 - 25.5	7.8 7.5 - 8.0	7.4 7.0 - 7.6	7.63 7.49 - 7.97	7.54 7.31 - 7.84	285 275 - 292
	43.9%	25.5 25.2 - 25.6	25.2 25.0 - 25.6	7.8 7.5 - 8.0	7.3 6.4 - 7.6	7.61 7.46 - 7.97	7.52 7.14 - 7.85	258 251 - 264
	72%	25.5 25.2 - 25.6	25.2 25.0 - 25.6	7.8 7.5 - 8.0	7.4 6.9 - 7.6	7.59 7.42 - 7.98	7.53 7.27 - 7.87	220 215 - 226
	100%	25.5 25.2 - 25.6	25.2 25.0 - 25.6	7.8 7.5 - 8.0	7.4 7.1 - 7.7	7.55 7.36 - 7.96	7.54 7.29 - 7.87	184 180 - 187
	Intake	25.5 25.2 - 25.6	25.2 25.0 - 25.6	7.8 7.5 - 8.0	7.4 7.1 - 7.6	7.53 7.32 - 7.95	7.53 7.28 - 7.85	180 177 - 183

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	25.3	24.9	25.6

SUMMARY / CONCLUSIONS

Outfall 101 samples collected August 3-8, 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_{25} values in g/L 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
August 5-12, 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-August 8, 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
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-August 8, 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
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-August 8, 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
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-August 8, 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
08/03/2003	-	<0.0050	-	-	-	-	-
08/04/2003	-	<0.0050	0.058	0.020	-	-	-
08/05/2003	-	<0.0051	0.057	0.020	-	-	0.025
08/06/2003	-	<0.0084	0.057	0.020	-	-	0.025
08/07/2003	-	0.0129	0.057	0.020	-	-	0.024
08/08/2003	-	0.0153	0.057	0.020	0.009	-	-

Sequoyah Nuclear Plant Biomonitoring
August 5-12, 2003

Appendix C

Chain of Custody Records and Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

Environmental Testing Solutions, LLC
Research Building
351 DEPOT STREET
ASHEVILLE. NC 28801
Phone: 828-350-9364
Fax: 256-386-2963

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): _____

General Comments:
* Custody seals intact, samples received in good condition.
JHunter

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use Project # 71				
	—	—	Start	End	—	—	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	1318 8/3/03	8/4/03 1218	2(2.5g)				✓		030805.04	0.9°C	JH	1016	* See
SQN-INT-TOX	comp	4	1300 8/3/03	8/4/03 1200	1 (2.5g)				✓		030805.05	0.9°C	JH	1016	COMMENTS

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	8/4/03 1500	FED EX	8/4/03 1500
FedEx	08-05-03 1016	JHunter	08-05-03 1016

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.

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
08-05-03	1016	J. Sumner	FedEx	4.0	789	030805.01	CORR ERI - McQuay International, After air stripper	AL	
08-05-03	1016	J. Sumner	FedEx	4.0	789	030805.02	CORR ERI - McQuay International, After swale	NC	
08-05-03	1016	J. Sumner	FedEx	4.5	790	030805.03	Progress Energy Carolinas - Sutton Plant	NC	
08-05-03	1016	J. Sumner	FedEx	0.9	791	030805.04	TVA, Sequoyah Nuclear Plant - Outfall 101	TN	
08-05-03	1016	J. Sumner	FedEx	0.9	791	030805.05	TVA, Sequoyah Nuclear Plant - Intake	TN	
08-05-03	1016	J. Sumner	FedEx	1.2	792	030805.06	TVA, Gallatin Fossil Plant - Outfall 001	TN	
08-05-03	1016	J. Sumner	FedEx	1.2	792	030805.07	TVA, Gallatin Fossil Plant - Intake	TN	
08-05-03	1141	J. Sumner	L. Coward	0.7	793	030805.08	Blue Ridge Parkway - Mt. Pisgah Lodge	NC	
08-05-03	1435	J. Sumner	Asheville Courier	0.2	794	030805.09	Spruce Pine WWTP	NC	
08-05-03	1435	J. Sumner	Asheville Courier	0.4	795	030805.10	Baxter Healthcare Corporation	NC	
08-05-03	1435	J. Sumner	Asheville Courier	0.9	796	030805.11	CommScope, Inc.	NC	
08-05-03	1435	J. Sumner	Asheville Courier	0.6	797	030805.12	Waynesville WWTP	NC	
08-05-03	1634	J. Sumner	A+ Delivery	0.3	798	030805.13	TriTest, Inc. - Apex WWTP	NC	
08-05-03	1634	J. Sumner	A+ Delivery	0.3	799	030805.14	TriTest, Inc. - OWASA Mason Farms	NC	

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

Environmental Testing Solutions, LLC

Research Building

351 DEPOT STREET
ASHEVILLE. NC 28801

Phone: 828-350-9364

Fax: 256-386-2963

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): _____

General Comments:

* Custody seals intact. Sample received in good condition.

J|unner

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use Project # 791				
	—	—	Start	End	—	—	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appearance
~~SQN-101-TOX~~	comp	4	1349 8/5/03	8/6/03 1249	2(2.5g)			—			* SAMPLE NOT RECEIVED FROM FEDEX				
SQN-INT-TOX	comp	4	1325 8/5/03	8/6/03 1225	1 (2.5g)			—			~~0.5°C~~	0.5°C	J|	0946	*SEE COMMENTS
											030807.06				

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	8/6/03 1500	FED EX	8/6/03 1500
FedEx	08-07-03 0946	J|unner ETS	08-07-03 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.

SQN Toxicity Samples

8/6/2003

Toxicity samples were pulled off and packaged into 3 coolers by Wanda Allen and Ronnie Hankins. Wanda Allen sealed these 3 coolers with COC seals, and gave them to David Porter to deliver to FedEx. David delivered 1 cooler (intake sample) to FedEx and the other 2 coolers (diffuser samples) to TVA Central Labs instead. Lewis O'Rear at TVA Central Labs received the 2 coolers. Lewis broke the COC seals and realized the samples were not TVA Central Labs and placed the 2 diffuser coolers into the walk-in cooler at TVA Central Labs.

8/7/2003

Wanda Allen and Ronnie Hankins went to TVA Central Labs and retrieved the 2 coolers from Lewis O'Rear. The diffuser samples were still packed in ice in the original coolers and the coolers had been placed in TVA Central Labs walk-in cooler all night. Wanda Allen re-iced the samples and re-sealed them with new COC seals and gave the 2 sealed coolers to Ann Hurt. Ann Hurt relinquished the 2 coolers to Sonic Delivery to be delivered to Kelly Keenan at ETS in Ashville, North Carolina. Kelly received the 2 coolers from Sonic Delivery the evening of 8/7/03.

8/14/2003
Ann Hurt
Environmental Scientist
TVA Sequoyah Nuclear Plant

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

Environmental Testing Solutions, LLC
Research Building
351 DEPOT STREET
ASHEVILLE, NC 28801
Phone: 828-350-9364
Fax: ~~256-386-2963~~ AH 8/7/03
828-350-9368

Delivered By (Circle One): AH 8/7/03
FedEx UPS Bus Client
Other (specify): SONIC DELIVERY

General Comments:
* Custody seals intact. Samples received in good condition.
Jumner

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time Start	Collection Date/Time End	Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate) Y-	If Yes, Inches	No	Trace	Laboratory Use: Project # 791 EST Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	1349 8/5/03	8/6/03 1249	2(2.5g)			0.37 ✓			030807.08	0.6 C	JH	1800	SEE COMMENTS
~~SQN-INT-TOX~~	~~comp~~	~~4~~	~~1325 8/5/03~~	~~8/6/03 1225~~	~~1 (2.5g)~~			✓ 0.37							

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
~~Wanda Allen~~ AH 8/7/03	~~8/6/03 1500~~ AH 8/7/03	~~FED EX~~ AH 8/7/03	~~8/6/03 1500~~ AH 8/7/03
Gordon Morris	8/7/03 @ 1756	ETS - KELLY KEENAN	8/7/03 @ 1756
Gordon Morris		Gordon Morris	
SONIC DELIVERY	08-07-03 1800	Jumner ETS	08-07-03 1800

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.

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
08-07-03	0946	K. Keenan	FedEx	0.3	789	030807.01	CORR ERI - McQuay International, After air stripper	AL	
08-07-03	0946	K. Keenan	FedEx	0.3	789	030807.02	CORR ERI - McQuay International, After swale	AL	
08-07-03	0946	K. Keenan	FedEx	0.4	810	030807.03	Duke Energy Corporation - McQuire Nuclear Station, Outfall 002	NC	
08-07-03	0946	K. Keenan	FedEx	0.3	811	030807.04	PCS Phosphate Company, Inc. - Outfall 007	NC	
08-07-03	0946	K. Keenan	FedEx	0.2	811	030807.05	PCS Phosphate Company, Inc. - Outfall 100	NC	
08-07-03	0946	J. Sumner	FedEx	0.5	791	030807.06	TVA - Sequoyah Nuclear Plant, Intake	TN	
08-07-03	1436	J. Sumner	K. Keenan	3.7	812	030807.07	Test America, Inc. - Earth Environmental Services, Marshall WWTP	NC	
08-07-03	1800	J. Sumner	O. Mains - Sonic Delivery	0.6	791	030807.08	TVA - Sequoyah Nuclear Plant, Outfall 101	TN	

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: WANDA ALLEN

Environmental Testing Solutions, LLC
Research Building
351 DEPOT STREET
ASHEVILLE. NC 28801
Phone: 828-350-9364
Fax: 256-386-2963

Delivered By (Circle One):
FedEx UPS Bus Client
Other (specify): _____

General Comments:
* Custody seals intact. Samples received in good condition.
J/umsa

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use Project #791				
	—	—	Start	End	—	—	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	1440 8/7/03	8/8/03 1340	2(2.5g)			✓			03809.01	1.2°C	KEK	0940	* See comments
SQN-INT-TOX	comp	4	1450 8/7/03	8/8/03 1350	1 (2.5g)			✓			03809.02	1.3°C	KEK	0940	↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	8/8/03 1500	FED EX	8/8/03 1500
FedEx	08-09-03 0940	KEKeenan ETS	08-09-03 0940

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.

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
08-09-03	0940	K. Keenan	FedEx	1.2	791	030809.01	TVA, Sequoyah Nuclear Plant - Outfall 101	TN	
08-09-03	0940	K. Keenan	FedEx	1.3	791	030809.02	TVA, Sequoyah Nuclear Plant - Intake	TN	
08-09-03	0940	K. Keenan	FedEx	0.2	813	030809.03	Hercules, Inc.	GA	
08-09-03	0942	K. Keenan	FedEx	3.7	803	030809.04	Duke Energy Corporation - Belews Creek Steam Station	NC	
08-09-03	1035	K. Keenan	Lighthouse	0.4	799	030809.05	TriTest, Inc. - OWASA Mason Farms	NC	
08-09-03	1035	J. Sumner	Lighthouse	0.4	798	030809.06	TriTest, Inc. - Apex WWTP	NC	
08-09-03	1035	J. Sumner	Lighthouse	0.4	807	030809.07	TriTest, Inc. - Wilson WWTP	NC	
08-09-03	2200	J. Sumner	Greyhound	0.4	792	030809.08	TVA, Gallatin Fossil Plant - Outfall 001	TN	
08-09-03	2200	J. Sumner	Greyhound	0.4	792	030809.09	TVA, Gallatin Fossil Plant - Intake	TN	

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

Client: TVA
Facility: Sequoyah Nuclear Plant
Nontreated
NPDES #: TN 0026450
Project #: 791

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 25.5		*Test information:*	
Organism age:	24 TO 29.5 HOURS OLD	Randomizing template:	Yellow
Date and times organisms were born between:	08-04-03 1100 TO 1330 MDT 1300 - 1530 EDT	Incubator number:	3
Organism source:	ABS BATCH 08-04-03	*Artemia* lot number:	8604030
Transfer bowl information:	pH = 7.80 Temperature = 24.6 °C	Total drying time:	18 HOURS
		Date / Time in: 08-12-03	1500
Average transfer volume:	10.4 ml	Date / Time out: 08-13-03	0800
		Oven temperature:	101°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used MHS	Sample numbers used	Analyst
0	08-05-03	—	1550	1433	08-01-03	030805.04/.05	JJ
1	08-06-03	0900	1500	1350	08-01-03	030805.04/.05	JJ
2	08-07-03	0900	1500	1545	08-01-03	030807.06/.08	JJ
3	08-08-03	0917	1520	1440	08-06-03	030807.06/.08	JJ
4	08-09-03	0856	1500	1409	08-08-03	030809.01/.02	JJ
5	08-10-03	0900	1505	1416	08-08-03	030809.01/.02	JJ
6	08-11-03	0853	1500	1420	08-08-03	030809.01/.02	JJ
7	08-12-03			1416			JJ

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	1.0162		NOEC	100%
Average weight per surviving larvae:	1.0162	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
Nontreated

Date: 08-05-03

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	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) Brown	15.150	14.996	14.573	14.853	15.271	15.181	14.715	14.597	15.046	14.670	14.988	15.008
B = Pan + Larvae weight (mg)	26.08	24.62	24.21	25.31	25.25	25.72	24.21	24.75	24.00	24.39	25.94	26.32
Larvae weight (mg) = A – B	10.930	9.624	9.637	10.457	9.979	10.539	9.495	10.153	8.954	9.689	10.952	11.312
Weight per initial number of larvae (mg) = C / Initial number of larvae	1.0930	0.9624	0.9637	1.0457	0.9979	1.0539	0.9495	1.0153	0.8954	0.9689	1.0952	1.1312
Average weight per initial number of larvae (mg)	1.0162				1.0042				1.0227			

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
Nontreated

Date: 08-05-03

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	9'd	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)	14.996	14.727	14.989	15.076	14.642	15.467	14.831	15.020	15.056	15.058	15.070	14.909
B = Pan + Larvae weight (mg)	25.46	24.03	24.61	23.73	24.08	25.52	27.01	23.95	26.81	24.92	23.91	26.05
Larvae weight (mg) = A – B	10.464	9.303	9.621	8.654	9.438	10.353	12.179	8.930	11.754	9.862	8.840	11.141
Weight per initial number of larvae (mg) = C / Initial number of larvae	1.0464	0.9303	0.9621	0.8654	0.9438	1.0353	1.2179	0.8930	1.1754	0.9862	0.8840	1.1141
Average weight per initial number of larvae (mg)	0.9511				1.0225				1.0399			

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
Nontreated

Date: 06-05-03

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	9	10	10	10
5	9	10	10	10
6	9	10	10	10
7	9	10	10	10
A = Pan weight (mg)	14.838	14.939	15.047	14.636
B = Pan + Larvae weight (mg)	24.84	24.92	26.15	26.44
Larvae weight (mg) = A – B	10.184	9.981	11.103	11.804
Weight per initial number of larvae (mg) = C / Initial number of larvae	1.0184	0.9981	1.1103	1.1804
Average weight per initial number of larvae (mg)	1.0768			

Calculations and data reviewed: dh

Comments:

Environmental Testing Solutions, Inc.

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: August 5-12, 2003

Project number: 791

Reviewed by: J Turner

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	15.150	26.080	10.930	1.0930	100.0	1.0162	6.3	Not applicable
	B	10	10	14.996	24.620	9.624	0.9624				
	C	10	10	14.573	24.210	9.637	0.9637				
	D	10	10	14.853	25.310	10.457	1.0457				
10.98%	E	10	10	15.271	25.250	9.979	0.9979	100.0	1.0042	4.3	1.2
	F	10	10	15.181	25.720	10.539	1.0539				
	G	10	10	14.715	24.210	9.495	0.9495				
	H	10	10	14.597	24.750	10.153	1.0153				
22%	I	10	10	15.046	24.000	8.954	0.8954	100.0	1.0227	10.7	-0.6
	J	10	10	14.701	24.390	9.689	0.9689				
	K	10	10	14.988	25.940	10.952	1.0952				
	L	10	10	15.008	26.320	11.312	1.1312				
43.9%	M	10	10	14.996	25.460	10.464	1.0464	100.0	0.9511	7.9	6.4
	N	10	10	14.727	24.030	9.303	0.9303				
	O	10	10	14.989	24.610	9.621	0.9621				
	P	10	10	15.076	23.730	8.654	0.8654				
72%	Q	10	10	14.642	24.080	9.438	0.9438	97.5	1.0225	14.0	-0.6
	R	10	10	15.167	25.520	10.353	1.0353				
	S	10	10	14.831	27.010	12.179	1.2179				
	T	10	9	15.020	23.950	8.930	0.8930				
100%	U	10	10	15.056	26.810	11.754	1.1754	100.0	1.0399	12.5	-2.3
	V	10	10	15.058	24.920	9.862	0.9862				
	W	10	10	15.070	23.910	8.840	0.8840				
	X	10	10	14.909	26.050	11.141	1.1141				
100% Intake	U	10	9	14.656	24.840	10.184	1.0184	97.5	1.0768	7.9	-6.0
	V	10	10	14.939	24.920	9.981	0.9981				
	W	10	10	15.047	26.150	11.103	1.1103				
	X	10	10	14.636	26.440	11.804	1.1804				

Outfall 101:
Dunnett's MSD value: 0.1721
PMSD: 16.9

Intake:
Dunnett's MSD value: 0.1032
PMSD: 10.2

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, Inc. chronic toxicity tests when a toxicant reduces Pimephales growth by 16.7% 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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/5/03	Test ID:	PpFRCR	Sample ID:	TVA,Sequoyah Nuclear Plant, Outfall 101
End Date:	8/12/03	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:	Non-treated.				

Conc-%	1	2	3	4
D-Control	1.0930	0.9624	0.9637	1.0457
10.98	0.9979	1.0539	0.9495	1.0153
22	0.8954	0.9689	1.0952	1.1312
43.9	1.0464	0.9303	0.9621	0.8654
72	0.9438	1.0353	1.2179	0.8930
100	1.1754	0.9862	0.8840	1.1141

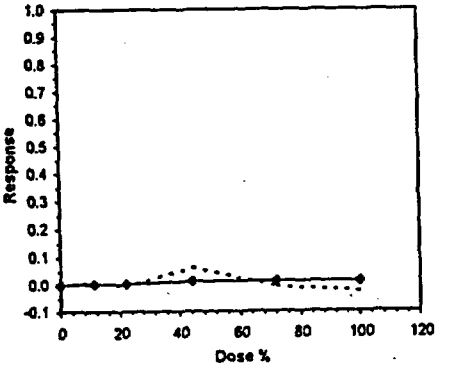
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.0162	1.0000	1.0162	0.9624	1.0930	6.332	4				1.0162	1.0000
10.98	1.0042	0.9881	1.0042	0.9495	1.0539	4.312	4	0.169	2.410	0.1721	1.0134	0.9973
22	1.0227	1.0064	1.0227	0.8954	1.1312	10.731	4	-0.091	2.410	0.1721	1.0134	0.9973
43.9	0.9511	0.9359	0.9511	0.8654	1.0464	7.911	4	0.912	2.410	0.1721	1.0045	0.9885
72	1.0225	1.0062	1.0225	0.8930	1.2179	13.981	4	-0.088	2.410	0.1721	1.0045	0.9885
100	1.0399	1.0233	1.0399	0.8840	1.1754	12.545	4	-0.332	2.410	0.1721	1.0045	0.9885

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97823745	0.884	0.237229017	-0.43334799
Bartlett's Test indicates equal variances (p = 0.44)	4.80380249	15.08631706		

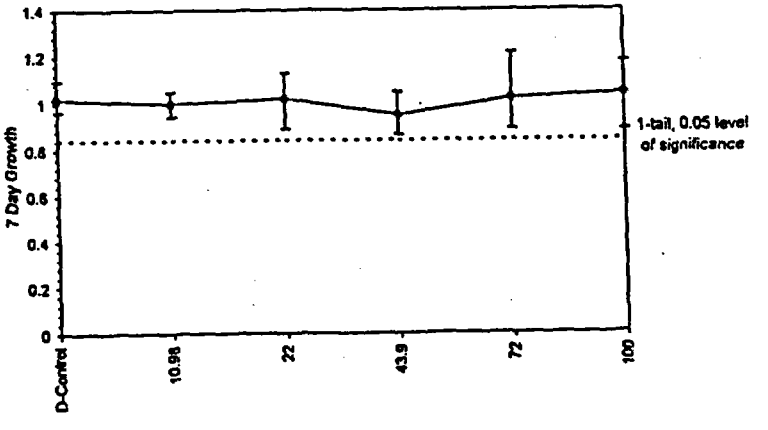
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.172069063	0.169325982	0.003806508	0.010195334	0.860294878	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/5/03	Test ID:	PpFRCR	Sample ID:	TVA,Sequoyah Nuclear Plant, Intake
End Date:	8/12/03	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

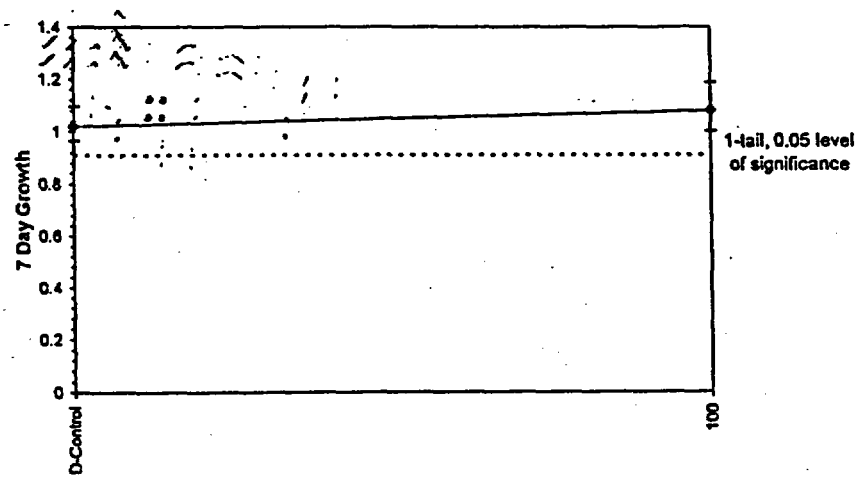
Comments: Non-treated.

Conc-%	1	2	3	4
D-Control	1.0930	0.9624	0.9637	1.0457
100	1.0184	0.9981	1.1103	1.1804

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	1.0162	1.0000	1.0162	0.9624	1.0930	6.332	4			
100	1.0768	1.0596	1.0768	0.9981	1.1804	7.854	4	-1.141	1.943	0.1032

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.8826198		0.749		0.36270522	-1.70952182
F-Test indicates equal variances (p = 0.66)	1.72792888		47.4683456			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.10324894	0.10160297	0.00734472	0.00564644	0.29754323	1, 6

Dose-Response Plot



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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 791

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	439	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:	GREEN
Date and times organisms were born between:	08-05-03 0832 TO 1100	Incubator number and shelf location:	2
Organism source:	07-29-03 A-F	YCT batch: ABS	07-22-03
Transfer bowl information:	pH = 7.85 Temperature = 25.0	*Selenastrum* batch: ABS	07-22-03

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHS	Sample numbers used	Analyst
0	08-05-03	1337	08-01-03	030805.04 / .05	JH
1	08-06-03	1325	08-01-03	030805.04 / .05	JH
2	08-07-03	1832	08-01-03	030807.06 / .08	JH
3	08-08-03	1328	08-06-03	030807.06 / .08	JH
4	08-09-03	1320	08-08-03	030809.01 / .02	JH
5	08-10-03	1330	08-08-03	030809.01 / .02	JH
6	08-11-03	1325	08-08-03	030809.01 / .02	JH
7	08-12-03	1243	—	JH	JH

POOLED CONTROLS

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 100%
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	100%
% Mortality:	~~32.0~~ 0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	32.0	≥ 15.0 offspring/female	ChV	>100%
% CV:	8.4%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant

Date: 08-05-03

CONTROL – 1

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	3	6	6	4	4	5	4	5	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	13*	11*	0	0	0	12*	15*
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	12	12	0	0	12	13	10	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	15	15	17	15	15	18	15	11	13
Total young produced		33	30	33	36	30	31	36	29	28	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.0

CONC: 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	6	6	5	6	4	4	3	6	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14*	0	11*	13*	13*	14*	14	13	11	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	13	0	0	1*	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	16	15	12	12	16	18	13	17	15
Total young produced		36	35	31	31	30	34	35	32	33	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.9
% Reduction from Control:	-2.8%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant Date: 08-05-03

CONC: 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	6	4	5	5	5	6	5	5	6	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	12	14	0	15	13	0	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	12	12	0	0	13	0	0	11	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	17	18	16	13	14	18	17	15	17
Total young produced		35	33	35	33	32	33	38	35	32	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.2
% Reduction from Control:	-6.9%

CONC: 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	6	6	6	5	5	5	5	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	13	12	15	12	12	12	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	13	11	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	12	17	16	16	15	17	14	14	14	17
Total young produced		29	36	33	35	32	37	31	31	32	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.2
% Reduction from Control:	-3.8%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant **Date:** 08-05-03

CONC: 72% *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	6	8	5	5	4	4	6	4	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	13	0	0	0	12	14	0	14	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	1*	0	12	14	13	0	0	12	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	18	17	18	18	13	17	18	13	17
Total young produced		33	37	34	37	36	29	35	36	31	39
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.7
% Reduction from Control:	-8.4%

CONC: 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	5	6	4	6	4	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	14	12	0	13	0	11	16	13	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	11	1*	14	3*	0	1*	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	16	18	16	17	19	14	15	17	17
Total young produced		36	35	36	31	37	37	32	36	36	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	35.2
% Reduction from Control:	-10.0%

Species: *Ceriodaphnia dubia*

Client: Sequoyah Nuclear Plant Date: 08-05-03

CONTROL ~ 2 *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	5	3	5	5	6	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	15	12	0	13	0	10	11	10	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	10	0	14	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	17	15	13	14	17	16	16	17	12
Total young produced		33	35	32	26	32	36	32	32	32	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.0
% Reduction from Control:	NA

CONC: 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	5	4	4	5	3	3	3	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	13	0	13	11	14	12	0	0	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	13	0	0	0	0	11	11	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	13	16	16	17	15	15	17	16	14	17
Total young produced		31	34	33	34	31	32	32	30	30	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.9
% Reduction from Control:	0.3%

Environmental Testing Solutions, Inc.

Verification of *Ceriodaphnia* Reproduction Totals

Control-1

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	3	6	6	4	4	5	4	5	6	48
5	0	0	0	13	11	0	0	0	12	15	51
6	12	12	12	0	0	12	13	10	0	0	71
7	16	15	15	17	15	15	18	15	11	13	150
Total	33	30	33	36	30	31	36	29	28	34	320

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	6	6	6	5	5	5	5	6	5	53
5	0	0	0	13	12	15	12	12	12	14	90
6	13	13	11	0	0	0	0	0	0	0	37
7	12	17	16	16	15	17	14	14	14	17	152
Total	29	36	33	35	32	37	31	31	32	36	332

Control-2

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	5	3	5	5	6	5	5	5	46
5	14	15	12	0	13	0	10	11	10	13	98
6	0	0	0	10	0	14	0	0	0	0	24
7	15	17	15	13	14	17	16	16	17	12	152
Total	33	35	32	26	32	36	32	32	32	30	320

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	5	6	5	5	5	4	4	6	4	6	50
5	13	13	0	0	0	12	14	0	14	16	82
6	1	0	12	14	13	0	0	12	0	0	52
7	14	18	17	18	18	13	17	18	13	17	163
Total	33	37	34	37	36	29	35	36	31	39	347

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	6	6	5	6	4	4	3	6	5	5	50
5	14	0	11	13	13	14	14	13	11	12	115
6	0	13	0	0	1	0	0	0	0	0	14
7	16	16	15	12	12	16	18	13	17	15	150
Total	36	35	31	31	30	34	35	32	33	32	329

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	5	6	4	6	4	4	5	5	5	49
5	14	14	12	0	13	0	11	16	13	14	107
6	0	0	0	11	1	14	3	0	1	0	30
7	17	16	18	16	17	19	14	15	17	17	166
Total	36	35	36	31	37	37	32	36	36	36	352

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	6	4	5	5	5	6	5	5	6	6	53
5	0	0	0	12	14	0	15	13	0	13	67
6	13	12	12	0	0	13	0	0	11	0	61
7	16	17	18	16	13	14	18	17	15	17	161
Total	35	33	35	33	32	33	38	35	32	36	342

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	5	4	4	5	3	3	3	5	5	41
5	14	13	0	13	11	14	12	0	0	10	87
6	0	0	13	0	0	0	0	11	11	0	35
7	13	16	16	17	15	15	17	16	14	17	156
Total	31	34	33	34	31	32	32	30	30	32	319

Environmental Testing Solutions, Inc.

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

:lient: TVA Sequoyah Nuclear Plant, Nontreated

Test dates: August 5-12, 2003

'roject number: 791

Revelwed by: _____

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from pooled controls (%)
	1	2	3	4	5	6	7	8	9	10				
Control - 1	33	30	33	36	30	31	36	29	28	34	100	32.0	8.8	Not applicable
Control - 2	33	35	32	26	32	36	32	32	32	30	100	32.0	8.5	Not applicable
Pooled Controls											100	32.0	8.4	Not applicable
10.98%	36	35	31	31	30	34	35	32	33	32	100	32.9	6.2	-2.8
22%	35	33	35	33	32	33	38	35	32	36	100	34.2	5.6	-6.9
43.9%	29	36	33	35	32	37	31	31	32	36	100	33.2	8.0	-3.8
72%	33	37	34	37	36	29	35	36	31	39	100	34.7	8.7	-8.4
100%	36	35	36	31	37	37	32	36	36	36	100	35.2	5.8	-10.0
100% Intake	31	34	33	34	31	32	32	30	30	32	100	31.9	4.5	0.3

)utfall 101:

)unnett's MSD value: 2.512

MSD: 7.9

ntake:

)unnett's MSD value: 1.684

MSD: 5.3

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, Inc. chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by10.2% from the control.

Lower PMSD bound determined by USEPA (10th percentile) = 11%.

Upper PMSD bound determined by USEPA (90th percentile) = 37%.

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

SEPA. 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 gency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/5/03	Test ID:	CdFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant, Outfall 101
End Date:	8/12/03	Lab ID:	BTS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	CHRONIC-(EPA-821-R-02-013)	Test Species:	CD-Ceriodaphnia dubia

Comments: Comparison to Control-1.

Conc-%	1	2	3	4	5	6	7	8	9	10
Control-1	33.000	30.000	33.000	36.000	30.000	31.000	36.000	29.000	28.000	34.000
10.98	36.000	35.000	31.000	31.000	30.000	34.000	35.000	32.000	33.000	32.000
22	35.000	33.000	35.000	33.000	32.000	33.000	38.000	35.000	32.000	36.000
43.9	29.000	36.000	33.000	35.000	32.000	37.000	31.000	31.000	32.000	36.000
72	33.000	37.000	34.000	37.000	36.000	29.000	35.000	36.000	31.000	39.000
100	36.000	35.000	36.000	31.000	37.000	37.000	32.000	36.000	36.000	36.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
Control-1	32.000	1.0000	32.000	28.000	36.000	8.839	10			33.700	1.0000
10.98	32.900	1.0281	32.900	30.000	36.000	6.155	10	115.50	75.00	33.700	1.0000
22	34.200	1.0688	34.200	32.000	38.000	5.650	10	126.00	75.00	33.700	1.0000
43.9	33.200	1.0375	33.200	29.000	37.000	8.007	10	117.50	75.00	33.700	1.0000
72	34.700	1.0844	34.700	29.000	39.000	8.704	10	130.50	75.00	33.700	1.0000
100	35.200	1.1000	35.200	31.000	37.000	5.807	10	137.50	75.00	33.700	1.0000

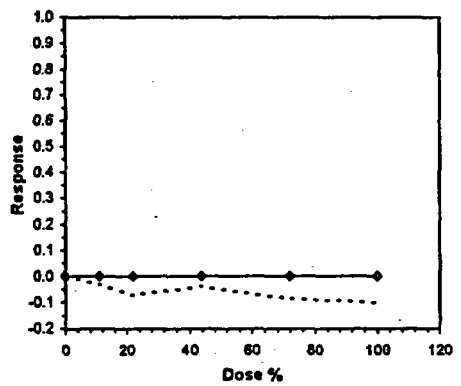
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.04534006	1.035	-0.194412	-0.5727649
Bartlett's Test indicates equal variances (p = 0.66)	3.27994871	15.0863171		
The control means are not significantly different (p = 1.00)	0	2.10092367		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

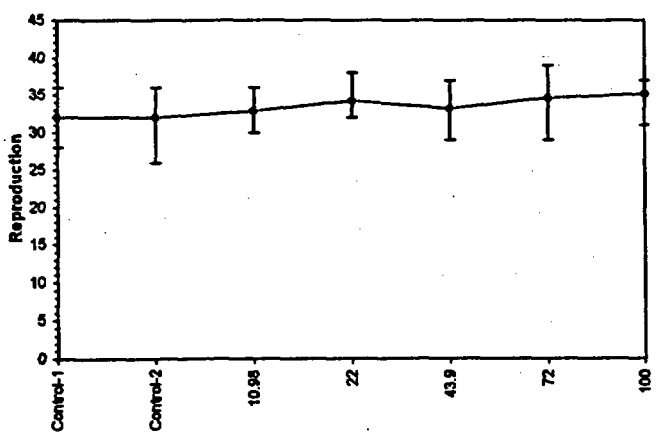
Treatments vs Control-1

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, Inc.

Statistical Analyses

Used for PMSD calculation only.			Ceriodaphnia Survival and Reproduction Test-Reproduction		
Start Date: 8/12/03	Test ID:	CdFRCR		Sample ID:	TVA, Sequoyah Nuclear Plant - Outfall 101
End Date: 8/19/03	Lab ID:	BTS-Env. Testing Solutions		Sample Type:	DMR-Discharge Monitoring Report
Sample Date:	Protocol:	CHRONIC-(EPA-821-R-02-013)		Test Species:	CD-Ceriodaphnia dubia
Comments: Comparison to Control-1.					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	33.000	30.000	33.000	36.000	30.000	31.000	36.000	29.000	28.000	34.000
10.98	36.000	35.000	31.000	31.000	30.000	34.000	35.000	32.000	33.000	32.000
22	35.000	33.000	35.000	33.000	32.000	33.000	38.000	35.000	32.000	36.000
43.9	29.000	36.000	33.000	35.000	32.000	37.000	31.000	31.000	32.000	36.000
72	33.000	37.000	34.000	37.000	36.000	29.000	35.000	36.000	31.000	39.000
100	36.000	35.000	36.000	31.000	37.000	37.000	32.000	36.000	36.000	36.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	32.000	1.0000	32.000	28.000	36.000	8.839	10			
10.98	32.900	1.0281	32.900	30.000	36.000	6.155	10	-0.819	2.287	2.512
22	34.200	1.0688	34.200	32.000	38.000	5.650	10	-2.003	2.287	2.512
43.9	33.200	1.0375	33.200	29.000	37.000	8.007	10	-1.092	2.287	2.512
72	34.700	1.0844	34.700	29.000	39.000	8.704	10	-2.458	2.287	2.512
100	35.200	1.1000	35.200	31.000	37.000	5.807	10	-2.913	2.287	2.512

Auxiliary Tests					Statistic		Critical		Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)					1.04534006		1.035		-0.194412	-0.57276493
Bartlett's Test indicates equal variances (p = 0.66)					3.27994871		15.0863171			
Hypothesis Test (1-tail, 0.05)	**NOEC**	**LOEC**	**ChV**	**TU**	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Dunnett's Test	100	>100		1	2.51186626	0.07849582	14.56	6.03333333	0.0478387	5, 54
Treatments vs D-Control										

Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/12/03	Test ID:	CdFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant - Intake
End Date:	8/19/03	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: Comparison to Control-2.

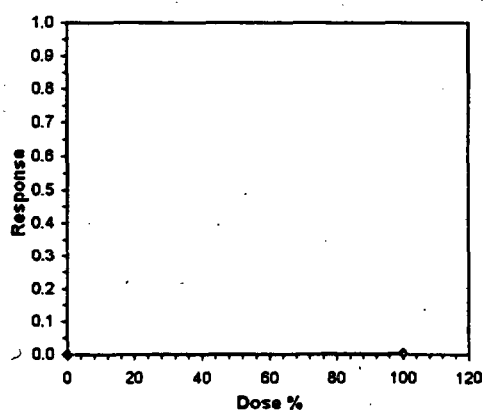
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	33.000	35.000	32.000	26.000	32.000	36.000	32.000	32.000	32.000	30.000
100	31.000	34.000	33.000	34.000	31.000	32.000	32.000	30.000	30.000	32.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	32.000	1.0000	32.000	26.000	36.000	8.463	10				32.000	1.0000
100	31.900	0.9969	31.900	30.000	34.000	4.543	10	0.103	1.734	1.684	31.900	0.9969

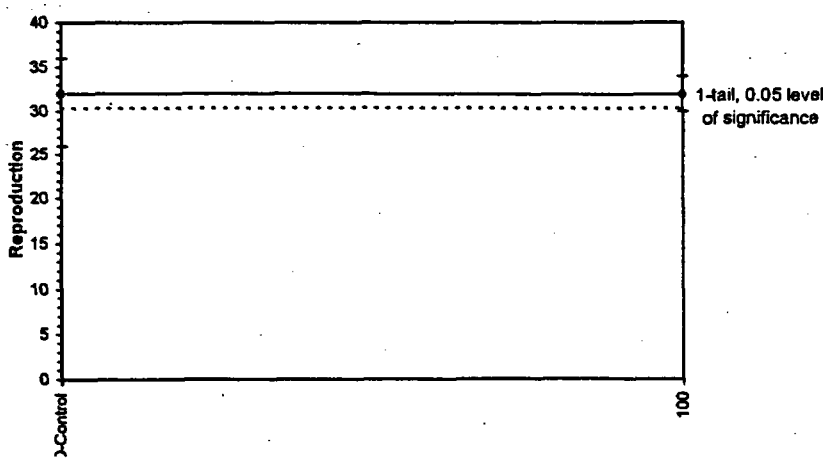
Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91454238		0.868		-0.7882598	2.67552132
F-Test indicates equal variances (p = 0.08)	3.49206352		6.54108572			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates no significant differences	1.68421476	0.05263171	0.05	4.71666667	0.91913337	1, 18
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



sqn_08-05-03data1.xls

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

Client: TVA
Facility: Sequoyah Nuclear Plant UV-Treated
NPDES #: TN 0026450
Project #: 791

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: 29 25.5		*Test information:*	
Organism age:	24 TO 29.5 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	08-04-03 1100 TO 1330 MDT 1300 - 1530 EDT	Incubator number:	3
Organism source:	ABS BATCH 08-04-03	*Artemia* lot number:	BG0403Q
Transfer bowl information:	pH = 7.80 Temperature = 24.6 °C	Total drying time:	48 HOURS
		Date / Time in: 08-12-03	1500
Average transfer volume:	10.4 ml	Date / Time out: 08-13-03	0800
		Oven temperature:	101°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	08-05-03	—	1550	1422	08-01-03 MHS	030805.04/.05	JL
1	08-06-03	0900	1500	1340	08-01-03	030805.04/.05	JL
2	08-07-03	0900	1500	1901	08-01-03	030807.06/.08	JL
3	08-08-03	0917	1520	1420	08-06-03	030807.06/.08	JL
4	08-09-03	0856	1500	1355	08-08-03	030809.01/.02	JL
5	08-10-03	0900	1505	1400	08-08-03	030809.01/.02	JL
6	08-11-03	0853	1500	1358	08-08-03	030809.01/.02	JL
7	08-12-03			1350			JL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.9063		NOEC	100%
Average weight per surviving larvae:	0.9063	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
UV-Treated

Date: 08-05-03

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	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) Purple	14.735	14.748	15.011	15.105	15.180	14.945	15.131	15.041	14.707	15.263	14.653	15.200
B = Pan + Larvae weight (mg)	24.02	23.88	24.44	23.51	26.08	26.20	25.56	25.09	24.08	25.69	24.37	25.19
Larvae weight (mg) = A – B	9.285	9.132	9.429	8.405	10.900	11.255	10.429	10.049	~~9.9134~~ 9.373	10.427	9.717	9.990
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.9285	0.9132	0.9429	0.8405	1.0900	1.1255	1.0429	1.0049	0.9373	1.0427	0.9717	0.9990
Average weight per initial number of larvae (mg)	0.9063				1.0658				0.9877			

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
UV-Treated

Date: 08-05-03

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)	14.831	14.726	14.999	14.719	14.959	15.003	15.020	14.995	15.012	15.009	15.109	14.759
B = Pan + Larvae weight (mg)	24.94	25.52	23.99	26.17	27.23	27.02	25.41	25.30	25.91	26.22	27.77	24.94
Larvae weight (mg) = A – B	10.109	10.794	8.991	11.451	12.271	11.957	10.390	10.305	10.898	11.211	12.661	10.181
Weight per initial number of larvae (mg) = C / Initial number of larvae	1.0109	1.0794	0.8991	1.1451	1.2271	1.1957	1.0390	1.0305	1.0898	1.1211	1.2661	1.0181
Average weight per initial number of larvae (mg)	1.0336				1.1231				1.1238			

Calculations and data reviewed: dl

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant
UV-Treated

Date: 08-05-03

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)	14.871	15.087	15.164	14.800
B = Pan + Larvae weight (mg)	26.78	24.37	26.08	25.10
Larvae weight (mg) = A – B	11.909	9.283	10.916	10.300
Weight per initial number of larvae (mg) = C / Initial number of larvae	1.1909	0.9283	1.0916	1.0300
Average weight per initial number of larvae (mg)	1.0602			

Calculations and data reviewed: JL

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: August 5-12, 2003

Project number: 791

Reviewed by: C Hunner

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	14.735	24.020	9.285	0.9285	100.0	0.9063	5.0	Not applicable
	B	10	10	14.748	23.880	9.132	0.9132				
	C	10	10	15.011	24.440	9.429	0.9429				
	D	10	10	15.105	23.510	8.405	0.8405				
10.98%	E	10	10	15.180	26.080	10.900	1.0900	100.0	1.0658	5.0	-17.6
	F	10	10	14.945	26.200	11.255	1.1255				
	G	10	10	15.131	25.560	10.429	1.0429				
	H	10	10	15.041	25.090	10.049	1.0049				
22%	I	10	10	14.707	24.080	9.373	0.9373	100.0	0.9877	4.5	-9.0
	J	10	10	15.263	25.690	10.427	1.0427				
	K	10	10	14.653	24.370	9.717	0.9717				
	L	10	10	15.200	25.190	9.990	0.9990				
43.9%	M	10	10	14.831	24.940	10.109	1.0109	100.0	1.0336	10.2	-14.1
	N	10	10	14.726	25.520	10.794	1.0794				
	O	10	10	14.999	23.990	8.991	0.8991				
	P	10	10	14.719	26.170	11.451	1.1451				
72%	Q	10	10	14.959	27.230	12.271	1.2271	100.0	1.1231	9.2	-23.9
	R	10	10	15.063	27.020	11.957	1.1957				
	S	10	10	15.020	25.410	10.390	1.0390				
	T	10	10	14.995	25.300	10.305	1.0305				
100%	U	10	10	15.012	25.910	10.898	1.0898	100.0	1.1238	9.3	-24.0
	V	10	10	15.009	26.220	11.211	1.1211				
	W	10	10	15.109	27.770	12.661	1.2661				
	X	10	10	14.759	24.940	10.181	1.0181				
100% Intake	Y	10	10	14.871	26.780	11.909	1.1909	100.0	1.0602	10.4	-17.0
	Z	10	10	15.087	24.370	9.283	0.9283				
	AA	10	10	15.164	26.080	10.916	1.0916				
	BB	10	10	14.800	25.100	10.300	1.0300				

Outfall 101:
Dunnett's MSD value: 0.1380
PMSD: 15.2

Intake:
Dunnett's MSD value: 0.1158
PMSD: 12.8

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, Inc. chronic toxicity tests when a toxicant reduces Pimephales growth by 16.7% 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, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/5/03	Test ID:	PpFRCR	Sample ID:	TVA,Sequoyah Nuclear Plant, Outfall 101
End Date:	8/12/03	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	0.9285	0.9132	0.9429	0.8405
10.98	1.0900	1.1255	1.0429	1.0049
22	0.9373	1.0427	0.9717	0.9990
43.9	1.0109	1.0794	0.8991	1.1451
72	1.2271	1.1957	1.0390	1.0305
100	1.0898	1.1211	1.2661	1.0181

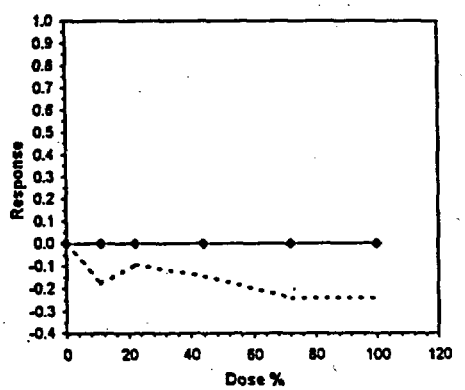
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9063	1.0000	0.9063	0.8405	0.9429	5.020	4				1.0400	1.0000
10.98	1.0658	1.1761	1.0658	1.0049	1.1255	4.960	4	-2.787	2.410	0.1380	1.0400	1.0000
22	0.9877	1.0898	0.9877	0.9373	1.0427	4.509	4	-1.422	2.410	0.1380	1.0400	1.0000
43.9	1.0336	1.1405	1.0336	0.8991	1.1451	10.168	4	-2.224	2.410	0.1380	1.0400	1.0000
72	1.1231	1.2392	1.1231	1.0305	1.2271	9.158	4	-3.787	2.410	0.1380	1.0400	1.0000
100	1.1238	1.2400	1.1238	1.0181	1.2661	9.274	4	-3.799	2.410	0.1380	1.0400	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9894892	0.884	0.08004414	-0.5285299
Bartlett's Test indicates equal variances (p = 0.48)	4.50414085	15.0863171		

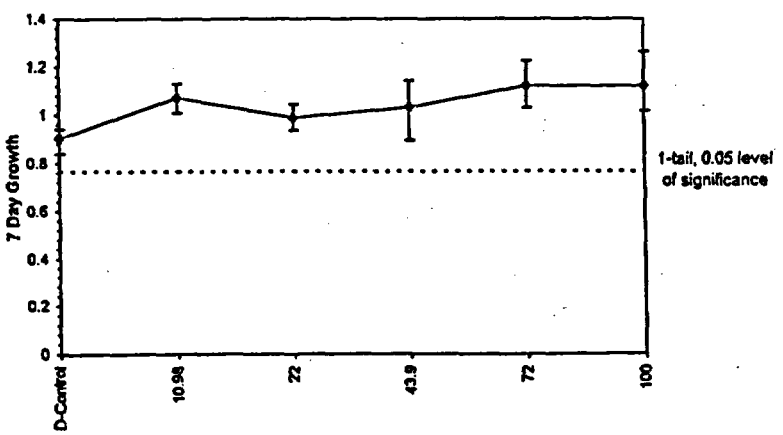
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.13797485	0.15224391	0.02819804	0.00655535	0.00947229	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_08-05-03data.xls

Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/5/03	Test ID:	PpFRCR	Sample ID:	TVA,Sequoyah Nuclear Plant, Intake
End Date:	8/12/03	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.

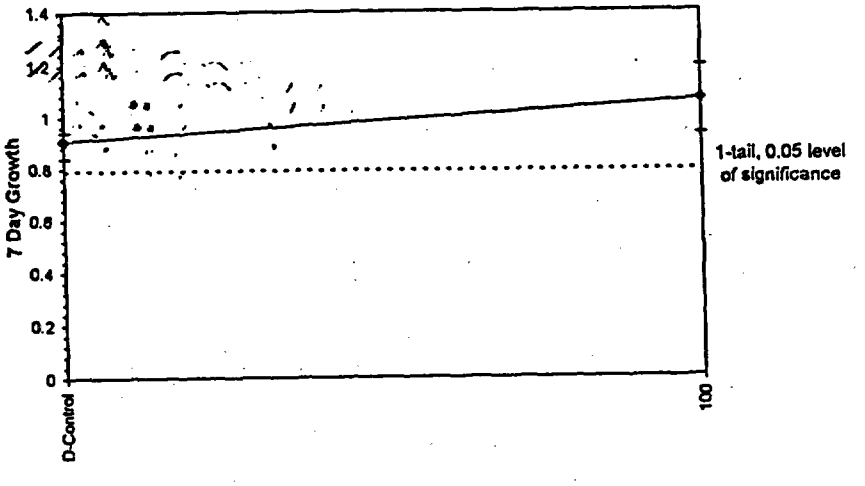
Conc-%	1	2	3	4
D-Control	0.9285	0.9132	0.9429	0.8405
100	1.1909	0.9283	1.0916	1.0300

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.9063	1.0000	0.9063	0.8405	0.9429	5.020	4			
100	1.0602	1.1698	1.0602	0.9283	1.1909	10.387	4	-2.584	1.943	0.1158

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96686405	0.749	-0.11350151	0.81562764
F-Test indicates equal variances (p = 0.18)	5.85831976	47.4683456		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.11576171	0.12773354	0.04738581	0.00709796	0.04155713	1, 6

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: August 05 - 12, 2003

Project number: 791

Reviewed by: [illegible]

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)	7.82	7.48	7.63	7.42	7.49	7.58	7.68	7.52	7.62	7.41	7.39	7.89	8.04	7.89
	DO (mg/L)	7.8	7.6	7.8	7.3	7.6	7.8	7.6	7.5	7.6	7.3	7.9	7.6	7.5	7.6
	Conductivity (µmhos/cm)	321		311		310		315		303		302		312	
	Alkalinity (mg/L $CaCO_3$)	59						61		60					
	Hardness (mg/L $CaCO_3$)	86						88		84					
	Temperature (°C)	25.1	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
10.98%	pH (SU)	7.58	7.41	7.56	7.41	7.38	7.52	7.67	7.48	7.58	7.37	7.66	7.84	8.01	7.87
	DO (mg/L)	7.6	7.3	7.8	7.4	7.7	7.8	8.2	7.5	8.1	7.2	7.7	7.5	7.8	7.5
	Conductivity (µmhos/cm)	298		299		282		290		300		298		309	
	Temperature (°C)	25.1	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
22%	pH (SU)	7.56	7.43	7.56	7.41	7.37	7.53	7.67	7.47	7.57	7.34	7.65	7.84	8.01	7.86
	DO (mg/L)	7.7	7.3	7.8	7.4	7.6	7.7	8.2	7.4	8.0	7.0	7.7	7.4	7.8	7.5
	Conductivity (µmhos/cm)	294		287		276		285		286		284		295	
	Temperature (°C)	25.2	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
43.9%	pH (SU)	7.52	7.38	7.53	7.40	7.31	7.52	7.65	7.47	7.54	7.31	7.60	7.82	8.00	7.83
	DO (mg/L)	7.7	7.3	7.8	7.4	7.6	7.7	8.2	7.6	8.0	7.0	7.8	7.4	7.8	7.5
	Conductivity (µmhos/cm)	266		261		251		256		260		255		266	
	Temperature (°C)	25.2	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
72%	pH (SU)	7.49	7.35	7.49	7.41	7.25	7.52	7.62	7.46	7.48	7.31	7.53	7.85	7.99	7.81
	DO (mg/L)	7.7	7.2	7.8	7.4	7.6	7.7	8.2	7.6	8.0	7.0	7.8	7.4	7.8	7.4
	Conductivity (µmhos/cm)	223		222		215		217		222		218		227	
	Temperature (°C)	25.3	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
100%	pH (SU)	7.47	7.39	7.43	7.39	7.16	7.54	7.58	7.43	7.45	7.28	7.47	7.90	7.98	7.87
	DO (mg/L)	7.7	7.2	7.8	7.4	7.8	7.7	8.2	7.6	8.0	7.0	7.9	7.5	7.8	7.5
	Conductivity (µmhos/cm)	185		184		180		184		185		182		191	
	Alkalinity (mg/L $CaCO_3$)	61				65				63					
	Hardness (mg/L $CaCO_3$)	74				74				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.3	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
100% Intake	pH (SU)	7.46	7.35	7.42	7.36	7.44	7.54	7.58	7.47	7.44	7.35	7.44	7.90	7.97	7.90
	DO (mg/L)	7.8	7.2	7.8	7.2	7.7	7.8	8.2	7.5	8.0	7.1	8.0	7.6	7.8	7.5
	Conductivity (µmhos/cm)	183		180		174		180		182		178		185	
	Alkalinity (mg/L $CaCO_3$)	61				63				62					
	Hardness (mg/L $CaCO_3$)	76				78				72					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.9	25.5	24.8	25.4	24.8	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6

Species: *Pimephales promelas*
Client: TVA / Sequoyah Nuclear Plant
Nontreated

Date: 08-05-03

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	7.82	7.48	7.63	7.42	7.49	7.58
	DO (mg/L)	7.8	7.6	7.8	7.3	7.6	7.6
	Conductivity (µmhos/cm)	321		311		310	
	Alkalinity (mg $CaCO_3$/L)	59					
	Hardness (mg $CaCO_3$/L)	86					
	Temperature (°C)	25.1	24.9	25.5	24.8	25.4	24.8
10.98%	pH (S.U.)	7.58	7.41	7.56	7.41	7.38	7.52
	DO (mg/L)	7.6	7.3	7.8	7.4	7.7	7.8
	Conductivity (µmhos/cm)	298		299		282	
	Temperature (°C)	25.1	24.9	25.5	24.8	25.4	24.8
22%	pH (S.U.)	7.56	7.43	7.56	7.41	7.37	7.53
	DO (mg/L)	7.7	7.3	7.8	7.4	7.6	7.7
	Conductivity (µmhos/cm)	294		287		276	
	Temperature (°C)	25.2	24.9	25.5	24.8	25.4	24.8
43.9%	pH (S.U.)	7.52	7.38	7.53	7.40	7.31	7.52
	DO (mg/L)	7.7	7.3	7.8	7.4	7.6	7.7
	Conductivity (µmhos/cm)	266		261		251	
	Temperature (°C)	25.2	24.9	25.5	24.8	25.4	24.8
72%	pH (S.U.)	7.49	7.35	7.49	7.41	7.25	7.52
	DO (mg/L)	7.7	7.2	7.8	7.4	7.6	7.7
	Conductivity (µmhos/cm)	223		222		215	
	Temperature (°C)	25.3	24.9	25.5	24.8	25.4	24.8
100%	pH (S.U.)	7.47	7.39	7.43	7.39	7.16	7.54
	DO (mg/L)	7.7	7.2	7.8	7.4	7.8	7.7
	Conductivity (µmhos/cm)	185		184		180	
	Alkalinity (mg $CaCO_3$/L)	61				65	
	Hardness (mg $CaCO_3$/L)	74				74	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.3	24.9	25.5	24.8	25.4	24.8
100% Intake	pH (S.U.)	7.46	7.35	7.42	7.36	7.44	7.54
	DO (mg/L)	7.8	7.2	7.8	7.2	7.7	7.8
	Conductivity (µmhos/cm)	183		180		174	
	Alkalinity (mg $CaCO_3$/L)	61				63	
	Hardness (mg $CaCO_3$/L)	76				78	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.9	25.5	24.8	25.4	24.8

Species: *Pimephales promelas*
Client: TVA / Sequoyah Nuclear Plant
Nontreated

Date: 08-05-03
* Changed pH probe on day 6.

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6 *	
CONTROL	pH (S.U.)	7.68	7.52	7.62	7.41	7.39	7.89	8.04	7.89
	DO (mg/L)	7.6	7.5	7.6	7.3	7.9	7.6	7.5	7.6
	Conductivity (µmhos/cm)	315		303		302		312	
	Alkalinity (mg $CaCO_3$/L)	61		60					
	Hardness (mg $CaCO_3$/L)	88		84					
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
10.98%	pH (S.U.)	7.67	7.48	7.58	7.37	7.66	7.84	8.01	7.87
	DO (mg/L)	8.2	7.5	8.1	7.2	7.7	7.5	7.8	7.5
	Conductivity (µmhos/cm)	290		300		298		309	
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
22%	pH (S.U.)	7.67	7.47	7.57	7.34	7.65	7.84	8.01	7.86
	DO (mg/L)	8.2	7.4	8.0	7.0	7.7	7.4	7.8	7.5
	Conductivity (µmhos/cm)	285		286		284		295	
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
43.9%	pH (S.U.)	7.65	7.47	7.54	7.31	7.60	7.82	8.00	7.83
	DO (mg/L)	8.2	7.6	8.0	7.0	7.8	7.4	7.8	7.5
	Conductivity (µmhos/cm)	256		260		255		260	
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
72%	pH (S.U.)	7.62	7.46	7.48	7.31	7.53	7.85	7.99	7.81
	DO (mg/L)	8.2	7.6	8.0	7.0	7.8	7.4	7.8	7.4
	Conductivity (µmhos/cm)	217		222		218		227	
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
100%	pH (S.U.)	7.68	7.43	7.45	7.28	7.47	7.90	7.98	7.87
	DO (mg/L)	8.2	7.6	8.0	7.0	7.9	7.5	7.8	7.5
	Conductivity (µmhos/cm)	184		185		182		191	
	Alkalinity (mg $CaCO_3$/L)			63					
	Hardness (mg $CaCO_3$/L)			76					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
100% Intake	pH (S.U.)	7.58	7.47	7.44	7.35	7.44	7.90	7.97	7.90
	DO (mg/L)	8.2	7.5	8.0	7.1	8.0 ~~7.8~~	7.6	7.8 ~~7.5~~	7.5
	Conductivity (µmhos/cm)	180		182		170		185	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			72					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.3	24.7	25.4	24.9	25.4	24.9	25.3	25.6
		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: August 05 - 12, 2003

Project number: 791

Reviewed by: [signature]

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)	7.82	7.57	7.63	7.68	7.49	7.63	7.68	7.61	7.62	7.50	7.39	7.97	8.04	7.94
	DO (mg/L)	7.8	7.6	7.8	7.9	7.6	8.0	7.6	8.0	7.6	7.5	7.9	7.7	7.5	7.7
	Conductivity (µmhos/cm)	321		311		310		315		303		302		312	
	Alkalinity (mg/L $CaCO_3$)	59						61		60					
	Hardness (mg/L $CaCO_3$)	86						88		84					
	Temperature (°C)	25.1	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
10.98%	pH (SU)	7.58	7.57	7.56	7.72	7.38	7.63	7.67	7.61	7.58	7.49	7.66	7.98	8.01	7.92
	DO (mg/L)	7.6	7.6	7.8	7.9	7.7	8.0	8.2	8.0	8.1	7.6	7.7	7.6	7.8	7.7
	Conductivity (µmhos/cm)	298		299		282		290		300		298		309	
	Temperature (°C)	25.1	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
22%	pH (SU)	7.56	7.56	7.56	7.75	7.37	7.62	7.67	7.62	7.57	7.49	7.65	7.96	8.01	7.93
	DO (mg/L)	7.7	7.6	7.8	7.9	7.6	8.0	8.2	8.0	8.0	7.6	7.7	7.6	7.8	7.7
	Conductivity (µmhos/cm)	294		287		276		285		286		284		295	
	Temperature (°C)	25.1	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
43.9%	pH (SU)	7.52	7.55	7.53	7.71	7.31	7.61	7.65	7.61	7.54	7.51	7.60	7.97	8.00	7.93
	DO (mg/L)	7.7	7.5	7.8	7.9	7.6	8.0	8.2	7.9	8.0	7.7	7.8	7.7	7.8	7.7
	Conductivity (µmhos/cm)	266		261		251		256		260		255		266	
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
72%	pH (SU)	7.49	7.54	7.49	7.81	7.25	7.61	7.62	7.64	7.48	7.51	7.53	7.98	7.99	7.93
	DO (mg/L)	7.7	7.5	7.8	7.9	7.6	8.0	8.2	7.9	8.0	7.7	7.8	7.7	7.8	7.7
	Conductivity (µmhos/cm)	223		222		215		217		222		218		227	
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
100%	pH (SU)	7.47	7.54	7.43	7.83	7.16	7.60	7.58	7.69	7.45	7.52	7.47	7.98	7.98	7.94
	DO (mg/L)	7.7	7.5	7.8	8.0	7.8	8.0	8.2	8.0	8.0	7.7	7.9	7.7	7.8	7.7
	Conductivity (µmhos/cm)	185		184		180		184		185		182		191	
	Alkalinity (mg/L $CaCO_3$)	61				65				63					
	Hardness (mg/L $CaCO_3$)	74				74				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
100% Intake	pH (SU)	7.46	7.54	7.42	7.52	7.44	7.62	7.58	7.69	7.44	7.54	7.44	8.01	7.97	7.95
	DO (mg/L)	7.8	7.5	7.8	7.5	7.7	8.0	8.2	8.0	8.0	7.8	8.0	7.8	7.8	7.7
	Conductivity (µmhos/cm)	183		180		174		180		182		178		185	
	Alkalinity (mg/L $CaCO_3$)	61				63				62					
	Hardness (mg/L $CaCO_3$)	76				78				72					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant Date: 08-05-03

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	7.82	7.57	7.63	7.68	7.49	7.63
	DO (mg/L)	7.8	7.6	7.8	7.9	7.6	8.0
	Conductivity (µmhos/cm)	321		311		310	
	Alkalinity (mg $CaCO_3$/L)	59					
	Hardness (mg $CaCO_3$/L)	86					
	Temperature (°C)	25.1	25.0	25.5	25.1	25.3	25.3
10.98%	pH (S.U.)	7.58	7.57	7.56	7.72	7.38	7.63
	DO (mg/L)	7.6	7.6	7.8	7.9	7.7	8.0
	Conductivity (µmhos/cm)	298		299		282	
	Temperature (°C)	25.1	25.0	25.5	25.1	25.3	25.3
22%	pH (S.U.)	7.56	7.56	7.52	7.75	7.37	7.62
	DO (mg/L)	7.7	7.6	7.8	7.9	7.6	8.0
	Conductivity (µmhos/cm)	294		287		276	
	Temperature (°C)	25.1	25.0	25.5	25.1	25.3	25.3
43.9%	pH (S.U.)	7.52	7.55	7.53	7.71	7.31	7.61
	DO (mg/L)	7.7	7.5	7.8	7.9	7.6	8.0
	Conductivity (µmhos/cm)	266		261		251	
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3
72%	pH (S.U.)	7.49	7.54	7.49	7.81	7.25	7.61
	DO (mg/L)	7.7	7.5	7.8	7.9	7.6	8.0
	Conductivity (µmhos/cm)	223		222		215	
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3
100%	pH (S.U.)	7.47	7.54	7.43	7.83	7.16	7.60
	DO (mg/L)	7.7	7.5	7.8	8.0	7.8	8.0
	Conductivity (µmhos/cm)	185		184		180	
	Alkalinity (mg $CaCO_3$/L)	61				65	
	Hardness (mg $CaCO_3$/L)	74				74	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3
100% Intake	pH (S.U.)	7.46	7.54	7.42	7.52	7.44	7.62
	DO (mg/L)	7.8	7.5	7.8	7.6	7.7	8.0
	Conductivity (µmhos/cm)	183		180		174	
	Alkalinity (mg $CaCO_3$/L)	61				63	
	Hardness (mg $CaCO_3$/L)	76				78	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.2	25.0	25.5	25.1	25.3	25.3

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant

Date: 08-05-03
* Changed pH probe on day 6.

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6 *	
CONTROL	pH (S.U.)	7.68	7.61	7.62	7.50	7.39	7.97	8.04	7.94
	DO (mg/L)	7.6	8.0	7.6	7.5	7.9	7.7	7.5	7.7
	Conductivity (µmhos/cm)	315		303		302		312	
	Alkalinity (mg $CaCO_3$/L)	61		60					
	Hardness (mg $CaCO_3$/L)	88		84		K		K	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
10.98%	pH (S.U.)	7.67	7.61	7.58	7.49	7.66	7.98	8.01	7.92
	DO (mg/L)	8.2	8.0	8.1	7.6	7.7	7.6	7.8	7.7
	Conductivity (µmhos/cm)	290		300		290		309	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
22%	pH (S.U.)	7.67	7.62	7.57	7.49	7.65	7.96	8.01	7.93
	DO (mg/L)	8.2	8.0	8.0	7.6	7.7	7.6	7.8	7.7
	Conductivity (µmhos/cm)	285		286		284		295	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
43.9%	pH (S.U.)	7.65	7.61	7.54	7.51	7.60	7.97	8.00	7.93
	DO (mg/L)	8.2	7.9	8.0	7.7	7.8	7.7	7.8	7.7
	Conductivity (µmhos/cm)	256		260		255		266	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
72%	pH (S.U.)	7.62	7.64	7.48	7.51	7.53	7.98	7.99	7.93
	DO (mg/L)	8.2	7.9	8.0	7.7	7.8	7.7	7.8	7.7
	Conductivity (µmhos/cm)	217		222		218		227	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
100%	pH (S.U.)	7.58	7.69	7.45	7.52	7.47	7.98	7.98	7.94
	DO (mg/L)	8.2	8.0	8.0	7.7	7.9	7.7	7.8	7.7
	Conductivity (µmhos/cm)	184 ~~187~~		185		182		191	
	Alkalinity (mg $CaCO_3$/L)			63					
	Hardness (mg $CaCO_3$/L)			76					
	TR Chlorine (mg/L)	K		<0.10		K		K	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
100% Intake	pH (S.U.)	7.58	7.69	7.44	7.54	7.44	8.01	7.97	7.95
	DO (mg/L)	8.2	8.0	8.0	7.8	8.0 ~~7.8~~ K	7.8	7.8	7.7
	Conductivity (µmhos/cm)	180		182		170		185	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			72					
	TR chlorine (mg/L)	K		<0.10		K		K	
	Temperature (°C)	25.4	25.1	25.5	25.0	25.3	25.2	25.2	25.2
		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: August 05 - 12, 2003

Project number: 791

Reviewed by: [illegible]

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)	7.54	7.35	7.50	7.52	7.57	7.56	7.67	7.47	7.56	7.35	7.62	7.88	7.97	7.85
	DO (mg/L)	7.7	7.7	7.7	7.3	7.7	7.8	8.0	7.5	7.8	7.2	7.8	7.6	7.8	7.6
	Conductivity (µmhos/cm)	314		296		303		300		302		292		311	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Temperature (°C)	24.9	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.5
10.98%	pH (SU)	7.55	7.30	7.50	7.50	7.55	7.56	7.68	7.48	7.58	7.32	7.62	7.84	7.97	7.85
	DO (mg/L)	7.7	7.6	7.9	7.3	7.6	7.7	8.0	7.5	7.8	7.0	7.7	7.5	7.8	7.5
	Conductivity (µmhos/cm)	305		294		297		294		297		286		304	
	Temperature (°C)	25.1	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.5
22%	pH (SU)	7.54	7.31	7.49	7.49	7.53	7.56	7.68	7.48	7.57	7.31	7.61	7.82	7.97	7.84
	DO (mg/L)	7.7	7.5	8.0	7.3	7.5	7.6	8.0	7.5	7.8	7.0	7.8	7.5	7.8	7.5
	Conductivity (µmhos/cm)	292		282		286		283		284		275		290	
	Temperature (°C)	25.1	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.5
43.9%	pH (SU)	7.52	7.30	7.46	7.47	7.50	7.56	7.68	7.47	7.55	7.14	7.60	7.84	7.97	7.85
	DO (mg/L)	7.7	7.5	8.0	7.3	7.5	7.6	8.0	7.5	7.8	6.4	7.8	7.4	7.8	7.5
	Conductivity (µmhos/cm)	264		258		258		256		258		251		264	
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
72%	pH (SU)	7.51	7.32	7.42	7.46	7.46	7.57	7.65	7.46	7.52	7.27	7.56	7.73	7.98	7.87
	DO (mg/L)	7.6	7.6	8.0	7.3	7.5	7.6	8.0	7.4	7.8	6.9	7.8	7.4	7.8	7.6
	Conductivity (µmhos/cm)	222		219		222		218		221		215		226	
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
100%	pH (SU)	7.48	7.29	7.36	7.45	7.42	7.57	7.63	7.46	7.50	7.30	7.52	7.87	7.96	7.85
	DO (mg/L)	7.7	7.6	8.0	7.2	7.5	7.7	8.0	7.5	7.8	7.1	7.8	7.2	7.8	7.5
	Conductivity (µmhos/cm)	185		182		186		183		185		180		187	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
100% Intake	pH (SU)	7.45	7.29	7.32	7.46	7.38	7.57	7.62	7.45	7.46	7.28	7.50	7.85	7.95	7.84
	DO (mg/L)	7.7	7.5	7.9	7.1	7.5	7.6	8.0	7.5	7.8	7.2	7.7	7.4	7.8	7.5
	Conductivity (µmhos/cm)	180		177		183		180		181		177		180	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6

Species: *Pimephales promelas*
Client: TVA / Sequoyah Nuclear Plant
UV-Treated

Date: 08-05-03

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	7.54	7.35	7.50	7.52	7.57	7.56
	DO (mg/L)	7.7	7.7	7.7	7.3	7.7	7.8
	Conductivity (µmhos/cm)	314		296		303	
	Alkalinity (mg $CaCO_3$/L)						
	Hardness (mg $CaCO_3$/L)						
	Temperature (°C)	24.9	25.2	25.6	25.1	25.5	25.2
10.98%	pH (S.U.)	7.55	7.30	7.50	7.50	7.55	7.56
	DO (mg/L)	7.7	7.6	7.9	7.3	7.6	7.7
	Conductivity (µmhos/cm)	305		294		297	
	Temperature (°C)	25.1	25.2	25.6	25.1	25.5	25.2
22%	pH (S.U.)	7.54	7.31	7.49	7.49	7.53	7.56
	DO (mg/L)	7.7	7.5	8.0	7.3	7.5	7.6
	Conductivity (µmhos/cm)	292		282		286	
	Temperature (°C)	25.1	25.2	25.6	25.1	25.5	25.2
43.9%	pH (S.U.)	7.52	7.30	7.46	7.47	7.50	7.56
	DO (mg/L)	7.7	7.5	8.0	7.3	7.5	7.6
	Conductivity (µmhos/cm)	264		258		258	
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2
72%	pH (S.U.)	7.51	7.32	7.42	7.46	7.46	7.57
	DO (mg/L)	7.6	7.6	8.0	7.3	7.5	7.6
	Conductivity (µmhos/cm)	222		219		222	
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2
100%	pH (S.U.)	7.48	7.29	7.36	7.45	7.42	7.57
	DO (mg/L)	7.7	7.6	8.0	7.2	7.5	7.7
	Conductivity (µmhos/cm)	185		182		186	
	Alkalinity (mg $CaCO_3$/L)						
	Hardness (mg $CaCO_3$/L)						
	TR chlorine (mg/L)						
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2
100% Intake	pH (S.U.)	7.45	7.29	7.32	7.46	7.38	7.57
	DO (mg/L)	7.7	7.5	7.9	7.1	7.6	7.6
	Conductivity (µmhos/cm)	180		177		183	
	Alkalinity (mg $CaCO_3$/L)						
	Hardness (mg $CaCO_3$/L)						
	TR chlorine (mg/L)						
	Temperature (°C)	25.2	25.2	25.6	25.1	25.5	25.2

Species: *Pimephales promelas*
Client: TVA / Sequoyah Nuclear Plant
UV-Treated

Date: 08-05-03
* Changed pH probe on day 6.

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6 *	
CONTROL	pH (S.U.)	7.67	7.47	7.56	7.35	7.62	7.88	7.97	7.85
	DO (mg/L)	8.0	7.5	7.8	7.2	7.8	7.6	7.8	7.6
	Conductivity (µmhos/cm)	300		302		292		311	
	Alkalinity (mg $CaCO_3$/L)								
	Hardness (mg $CaCO_3$/L)								
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.5
10.98%	pH (S.U.)	7.68	7.48	7.58	7.32	7.62	7.84	7.97	7.85
	DO (mg/L)	8.0	7.5	7.8	7.0	7.7	7.5	7.8	7.5
	Conductivity (µmhos/cm)	294		297		286		304	
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.5
22%	pH (S.U.)	7.68	7.48	7.57	7.31	7.61	7.82	7.97	7.84
	DO (mg/L)	8.0	7.5	7.8	7.0	7.8	7.5	7.8	7.5
	Conductivity (µmhos/cm)	283		284		275		290	
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.5
43.9%	pH (S.U.)	7.68	7.47	7.55	7.14	7.60	7.84	7.97	7.85
	DO (mg/L)	8.0	7.5	7.8	6.4	7.8	7.4	7.8	7.5
	Conductivity (µmhos/cm)	256		258		251		264	
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
72%	pH (S.U.)	7.65	7.46	7.52	7.27	7.56	7.73	7.98	7.87
	DO (mg/L)	8.0	7.4	7.8	6.9	7.8	7.4	7.8	7.6
	Conductivity (µmhos/cm)	218		221		215		226	
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
100%	pH (S.U.)	7.65	7.46	7.50	7.30	7.92	7.87	7.96	7.85
	DO (mg/L)	8.0	7.5	7.8	7.1	7.8	7.2	7.8	7.5
	Conductivity (µmhos/cm)	183		185		180		187	
	Alkalinity (mg $CaCO_3$/L)								
	Hardness (mg $CaCO_3$/L)								
	TR Chlorine (mg/L)								
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
100% Intake	pH (S.U.)	7.62	7.45	7.46	7.28	7.50	7.85	~~25.0~~	7.84
	DO (mg/L)	8.0	7.5	7.8	7.2	7.7 ~~7.7~~	7.4	7.95 7.8	7.5
	Conductivity (µmhos/cm)	180		181		177		180	
	Alkalinity (mg $CaCO_3$/L)								
	Hardness (mg $CaCO_3$/L)								
	TR chlorine (mg/L)								
	Temperature (°C)	25.4	25.1	25.4	25.2	25.5	25.0	25.6	25.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

Alkalinity
(EPA Method 310.1)
Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst: CAJ
Date analyzed: 08-12-03

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_2SO_4 = (5 ml Na_2CO_3 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
4.69	INR074	INR079	0.0	126	126	0.0198	9.9

blk correction 0.0

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5136	100	100	12.7	22.5	9.8	9.9	97	97.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = [(S - D) /[(S+D)/2]] x 100 (acceptable range = ± 10%)
08-01-03	MHS H2O A	100	22.5	28.5	6.0	9.9	S 59	
↓	Duplicate	↓	28.5	34.5	6.0	↓	D 59	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5136	50	100	28.5	39.4	10.9	9.9	108

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
59	49	98.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
08-01-03	MHS H2O B	100	39.4	45.4	6.0	9.9	59
08-01-03	SSW H2O		45.4	49.0	3.6		36
08-03-03	Salt H2O		0.0	14.8	14.8		146
08-06-03	MHS H2O		14.8	21.0	6.2		61
08-08-03	A		21.0	27.1	6.1		60
	B		27.1	33.0	5.9		58
	SSW H2O		33.2	36.5	3.3		33
	Salt SW		5.3	20.7	14.9		148
08-11-03	MHS H2O	↓	20.7	26.7	6.0	↓	59

Reviewed by: [signature] Date reviewed: 09-02-03

Environmental Testing Solutions, LLC

Alkalinity
(EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst: CAJ

Date analyzed: 08.12.03

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_2SO_4 = (5 ml Na_2CO_3 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

CAJ

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5136	100	100	26.7	36.6	9.9	9.9	98	98.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
08.11.03	Salt SW	100	3.6	18.3	14.7	9.9	S 146	
↓	Duplicate	↓	18.3	33.1	14.8	↓	D 146	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5136	50	100	18.3	38.1	19.8	9.9	196

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
146	50	100%

Sample measurements:

Sample number	Sample ID		Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
030805.04	SQN	1	100	38.1	44.3	6.2	9.9	61.4 = 61
030807.06		2		2.2	8.8	6.6		65.3 = 65
030809.01		3		8.8	15.2	6.4		63.4 = 63
030805.05	INH	1		15.2	21.4	6.2		61.4 = 61
030807.08		2		21.5	27.9	6.4		63.4 = 63
030809.02	↓	3		27.9	34.2	6.3		62.4 = 62
030805.06	GAF	1		34.2	45.2	11		108.9 = 110
030808.01		2		38	15.2	11.4		112.9 = 110
030809.08	↓	3	↓	25.9	36.5	10.6	↓	104.9 = 100

Reviewed by: dj

Date reviewed: 09-02-03

Alkalinity
(EPA Method 310.1)

Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst: CAJ

Date analyzed: 08-12-03

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_2SO_4 = (5 ml Na_2CO_3 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 $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 136	100	100	36.5	46.3	9.8	9.9	97	97.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030805.07	GAF INT 1	100	2.9	9.7	6.8	9.9	S 67.3 = 67	
↓	Duplicate	↓	9.7	16.6	6.9	↓	D 68.3 = 68	1.5 %

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 136	50	100	9.7	21.5	11.8	9.9	116.8

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
68.3	48.5	97.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
030808.02	GAF INT 2	100	21.5	30.1	8.6	9.9	85.1 = 85
030809.09	↓ 3	↓	30.1	37.6	7.5	↓	74.2 = 74

Reviewed by: [illegible] Date reviewed: 09-02-03

Total Hardness
(EPA Method 130.2)
Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst	CAJ
Date analyzed	08-12-03

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
INL078	INSS 092	0.1	9.8	9.7	0.0206	20.6

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 101	40	50	9.8	11.9	2.1	20.6	43.	107.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
08-01-03	MHS H20 A	50	11.9	16.0	4.1	20.6	S 84	
↓	Duplicate	↓	16.0	20.1	4.1	↓	D 84	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 101	40	50	16.0	22.1	6.1	20.6	126

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
84	42	105.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)	50	0.1	0.1	0.0	20.6	ND
0801.03	MHS H20 B		22.1	26.3	4.2		86
08-01-03	SSW H2O		26.6	28.9	2.3		47
08-06-03	MHS H2O		28.9	33.2	4.3		88
08-08-03	A		33.2	37.3	4.1		84
	B		37.3	41.4	4.1		84
08-08-03	SSW H2O		41.4	43.6	2.2		45
08-11-03	MHS H2O		43.6	47.6	4.0		82
030805.04	SQW 1		0.6	4.2	3.6		74.2
030807.06	2		4.2	7.8	3.6		74.2

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [signature] Date reviewed 09-02-03

Total Hardness
(EPA Method 130.2)
Matrix: Water, MDL = 1.0 mg $CaCO_3$/L

Analyst	CAJ
Date analyzed	08.12.03

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

CAJ

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 101	40.	50	7.8	9.9	2.1	20.6	43	107.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = [(S - D) /[(S+D)/2]] x 100 (acceptable range = ± 10%)
030809.01	SQN 3	50	9.9	13.6	3.7	20.6	S 76.2	
↓	Duplicate	↓	13.6	17.2	3.6	↓	D 74.2	2.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS101	40	50	13.6	19.1	5.5	20.6	113.3

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
74.2	39.1	97.8%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)						0
030805.05	SQN INT 1	50	19.1	22.8	3.7	20.6	76.2 = 76
030807.08	2		22.8	26.6	3.8		78.3 = 78
030809.02	3		26.6	30.1	3.5		72.1 = 72
030805.06	GAF 1		30.1	38.4	8.3		170.98 = 170
030808.01	2		38.4	46.6	8.2		168.9 = 170
030809.08	3		3.6	11.5	7.9		162.7 = 160
030805.07	INT 1		11.5	16.5	5.0		103 = 100
030808.02	2		16.5	21.8	5.3		109.2 = 110
030809.09	3		21.6	26.5	4.9		100.9 = 100

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 09.02.03

Environmental Testing Solutions, LLC

- 50.5%

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Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst	CAJ	Iodide reagent:	INR084
Date analyzed	08.05.03	Acid reagent:	INR083

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5134	INS5134

Note: For samples with a residual chlorine of > 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%)
INSS 134	0.50	0.542	108.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030805.01	Corr McQuay	very pale yellow, floating particles	S <0.000576	
↓	Duplicate pp		D <0.000545	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00303
030805.02	Corr. McQuay Cd	Very pale yellow, floating particles	<0.000486
030805.07	Gallatin Intake	Very pale yellow, floating particles	<0.000827
030805.06	GAF -001	Very pale yellow, floating particles	<0.000740
030805.04	SDN -101 - Tox	Very pale yellow, floating particles	0.0130
030805.05	SDN - Intake - Tox	Very pale yellow, floating particles	0.0144
030805.03	Sutton	pale yellow, some particles	<0.00325
TV=0.50	LCS	—	0.543
030805.14	Tritest - DWSA	pale yellow, clear	<0.000841
—			—

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%)
INSS 134	0.50	0.550	110%

Reviewed by	JS
Date reviewed	09-02-03

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L

Meter: Accumet Model AR25 pH/Ion Meter

Analyst	KEK	Iodide reagent:	IN8084
Date analyzed	08.07-03	Acid reagent:	IN8083

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS134	INSS134

Note: For samples with a residual chlorine of > 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%)
INSS134	0.50	0.542	108.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030807.04	PCS phos. 007	pale tan, floating particles	S <0.00149	
↓	Duplicate		D <0.00114	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00616
030807.05	PCS phosphate 100	no color, clear	<0.000550
030807.07	T. Amek - Marshall	no color, clear	<0.000438
030807.03	Duke - McQuire 002	pale green, slightly cloudy	<0.000945
030807.02	Cook - A1 - cd	pale tan, dirt particles	<0.00229
030807.01	↓ PP	no color, clear	<0.00117
030807.06	TVA - SQN INT	pale tan, clear	0.00292
030807.08	↓ SQN 101	PALE TAN, CLEAR	<0.00917

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%)
INSS134	0.50	0.511	102.2%

Reviewed by	[illegible]
Date reviewed	08-07-03

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L
Meter: Accumet Model AR25 pH/Ion Meter

Analyst	KJL	Iodide reagent:	INR084
Date analyzed	08-09-03	Acid reagent:	INR083

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS134	INSS134

Note: For samples with a residual chlorine of > 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%)
INSS134	0.50	0.500	100%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
030809.01	SQN101	pale tan, slightly cloudy	S <0.0156	
↓	Duplicate		D <0.0141	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00885
030809.02	SQN ~~101~~, INT	pale tan, slightly cloudy	<0.00878
030809.03	Hercules, Inc	tan, dirt, algae	<0.00487

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%)
INSS134	0.50	0.497	99.4%

Reviewed by	JH
Date reviewed	09-02-03

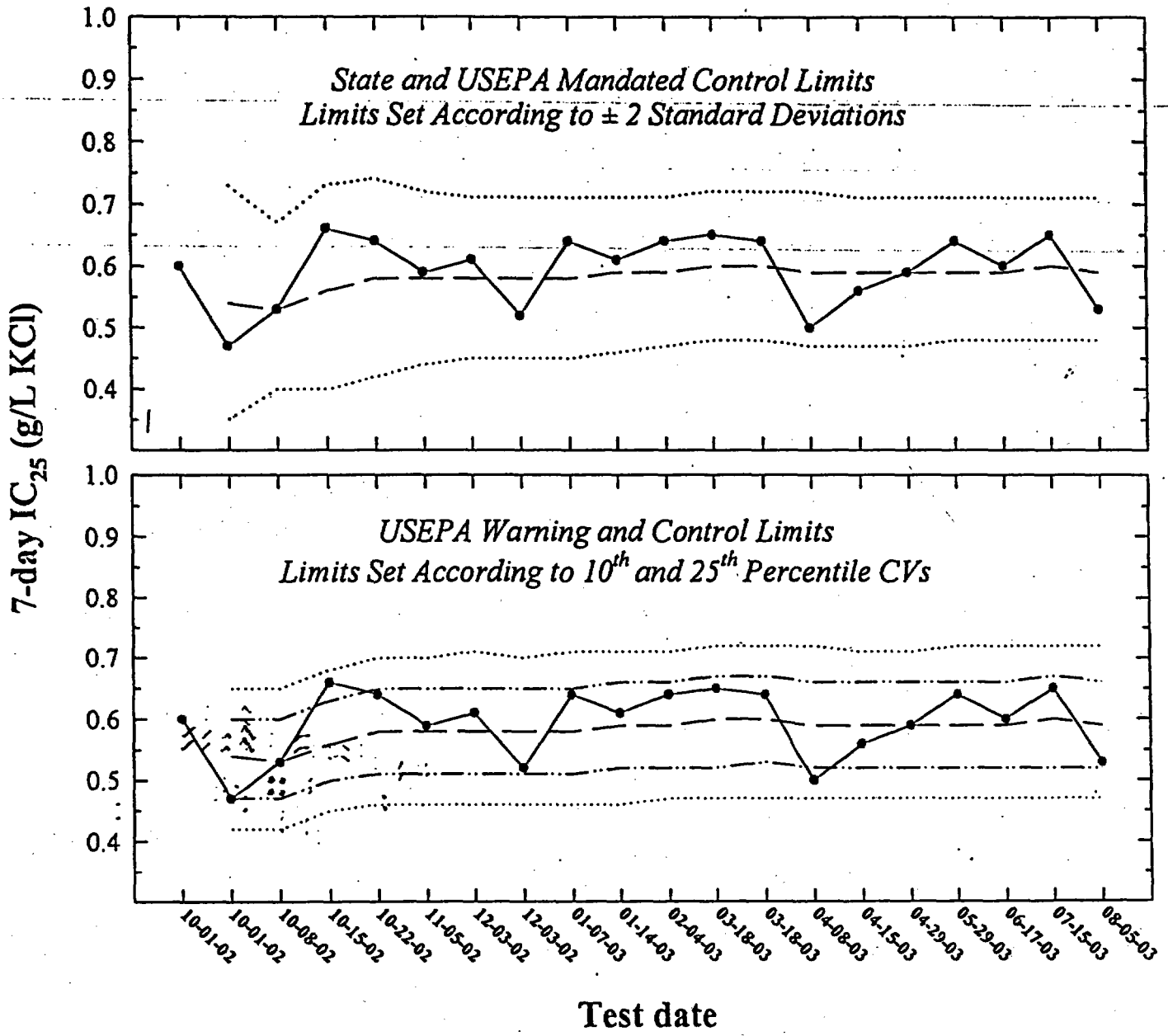
Sequoyah Nuclear Plant Biomonitoring
August 5-12, 2003

Appendix D

Reference Toxicant Test and Control Chart

Environmental Testing Solutions, Inc.

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, Inc.

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

Test number	Test date	7-day IC_{25} (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	10-01-02	0.60																	
2	10-01-02	0.47	0.54	0.09	0.35	0.73	0.06	0.47	0.60	0.11	0.42	0.65	0.20	0.33	0.74	0.24	0.30	0.78	0.18
3	10-08-02	0.53	0.53	0.07	0.40	0.67	0.06	0.47	0.60	0.11	0.42	0.65	0.20	0.33	0.74	0.24	0.29	0.77	0.13
4	10-15-02	0.66	0.56	0.08	0.40	0.73	0.07	0.50	0.63	0.12	0.45	0.68	0.21	0.35	0.78	0.25	0.31	0.82	0.15
5	10-22-02	0.64	0.58	0.08	0.42	0.74	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.14
6	11-05-02	0.59	0.58	0.07	0.44	0.72	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.12
7	12-03-02	0.61	0.58	0.07	0.45	0.71	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.11
8	12-03-02	0.52	0.58	0.06	0.45	0.71	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.11
9	01-07-03	0.64	0.58	0.06	0.45	0.71	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.11
10	01-14-03	0.61	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	0.10
11	02-04-03	0.64	0.59	0.06	0.47	0.71	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.82	0.27	0.32	0.86	0.10
12	03-18-03	0.65	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
13	03-18-03	0.64	0.60	0.06	0.48	0.72	0.07	0.53	0.67	0.13	0.47	0.72	0.23	0.37	0.83	0.27	0.33	0.87	0.10
14	04-08-03	0.50	0.59	0.06	0.47	0.72	0.07	0.52	0.66	0.12	0.47	0.72	0.22	0.37	0.82	0.27	0.33	0.86	0.11
15	04-15-03	0.56	0.59	0.06	0.47	0.71	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.81	0.27	0.32	0.86	0.10
16	04-29-03	0.59	0.59	0.06	0.47	0.71	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.81	0.27	0.32	0.86	0.10
17	05-29-03	0.64	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
18	06-17-03	0.60	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	0.09
19	07-15-03	0.65	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	0.86	0.09
20	08-05-03	0.53	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

Note: 7-d IC_{25} = 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_{25}).

S = Standard deviation of the IC_{25} values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC_{25} 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.

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. ($S_{A.10}$ = 0.12)

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. ($S_{A.25}$ = 0.21)

USEPA Control and Warning Limits

$S_{A.75}$ = Standard deviation corresponding to the 75th percentile CV. ($S_{A.75}$ = 0.38)

$S_{A.90}$ = Standard deviation corresponding to the 90th percentile CV. ($S_{A.90}$ = 0.45)

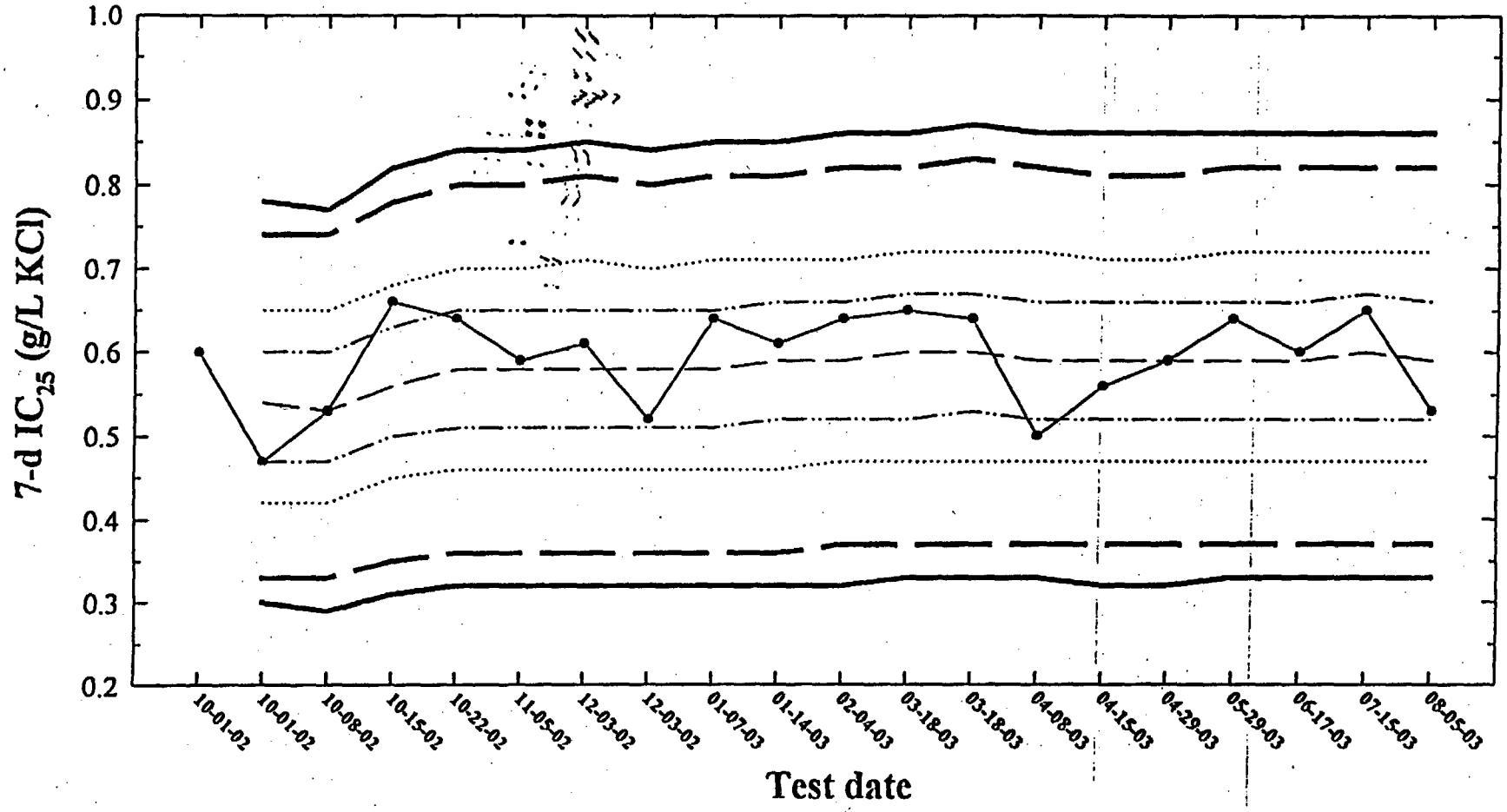
CV = Coefficient of variation of the IC_{25} values.

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.

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, Inc.

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, Inc.

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 (mg/larvae)	CT for Control Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	10-01-02	97.5	0.750		18.4		0.19	25.4	
2	10-01-02	100	0.975	0.862	12.7	15.5	0.13	12.8	19.1
3	10-08-02	97.5	0.929	0.885	8.0	13.0	0.18	19.5	19.2
4	10-15-02	100	1.037	0.923	16.9	14.0	0.23	21.9	19.9
5	10-22-02	100	0.822	0.902	10.6	13.3	0.13	15.6	19.0
6	11-05-02	100	0.874	0.898	2.8	11.6	0.12	13.8	18.2
7	12-03-02	100	0.852	0.891	9.1	11.2	0.12	13.7	17.5
8	12-03-02	100	0.668	0.863	10.4	11.1	0.15	22.4	18.1
9	01-07-03	100	0.886	0.866	4.1	10.3	0.14	15.7	17.9
10	01-14-03	100	0.677	0.847	3.0	9.6	0.07	11.0	17.2
11	02-04-03	97.5	0.933	0.855	14.1	10.0	0.15	16.5	17.1
12	03-18-03	100	0.838	0.853	8.0	9.8	0.15	18.5	17.2
13	03-18-03	100	0.803	0.849	21.3	10.7	0.21	26.5	17.9
14	04-08-03	100	1.083	0.866	6.1	10.4	0.09	8.0	17.2
15	04-15-03	100	0.892	0.868	17.0	10.8	0.17	18.7	17.3
16	04-29-03	97.5	1.021	0.877	6.7	10.6	0.18	17.5	17.4
17	05-29-03	100	1.005	0.885	7.9	10.4	0.11	11.1	17.0
18	06-17-03	97.5	0.888	0.885	4.2	10.1	0.18	20.7	17.2
19	07-15-03	100	0.910	0.886	6.7	9.9	0.12	13.7	17.0
20	08-05-03	97.5	1.092	0.897	6.5	9.7	0.13	11.8	16.7

Note: CV = Coefficient of variation for control growth.
On average, the CV for control growth is 9.7% in Environmental Testing Solutions, Inc. Pimephales chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th 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, Inc. chronic toxicity tests when a toxicant reduces Pimephales growth by 16.7% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

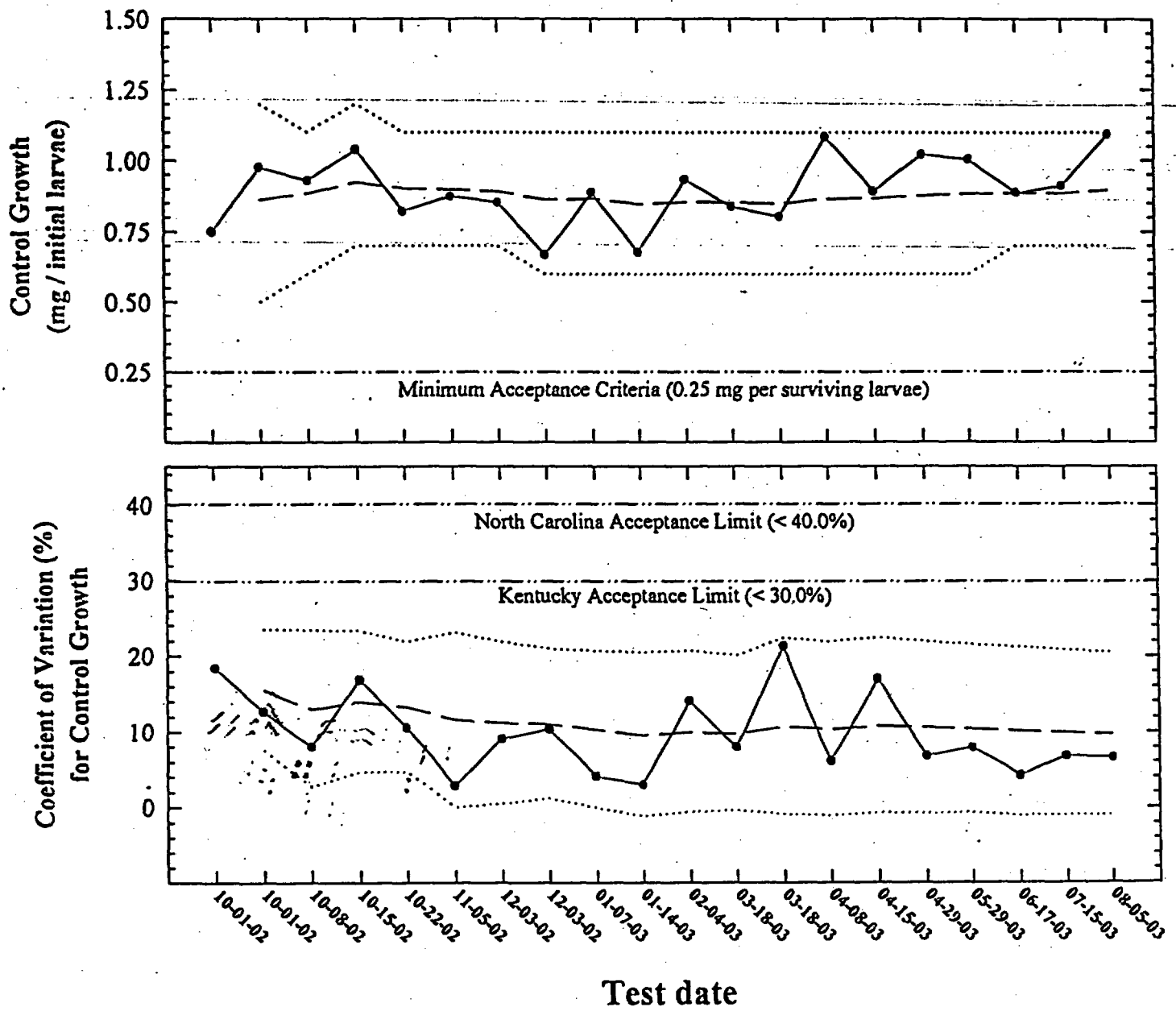
CT = Central Tendancy (mean Control Growth, CV, or PMSD)

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.

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, Inc.

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



Control Growth or Coefficient of Variation (CV)

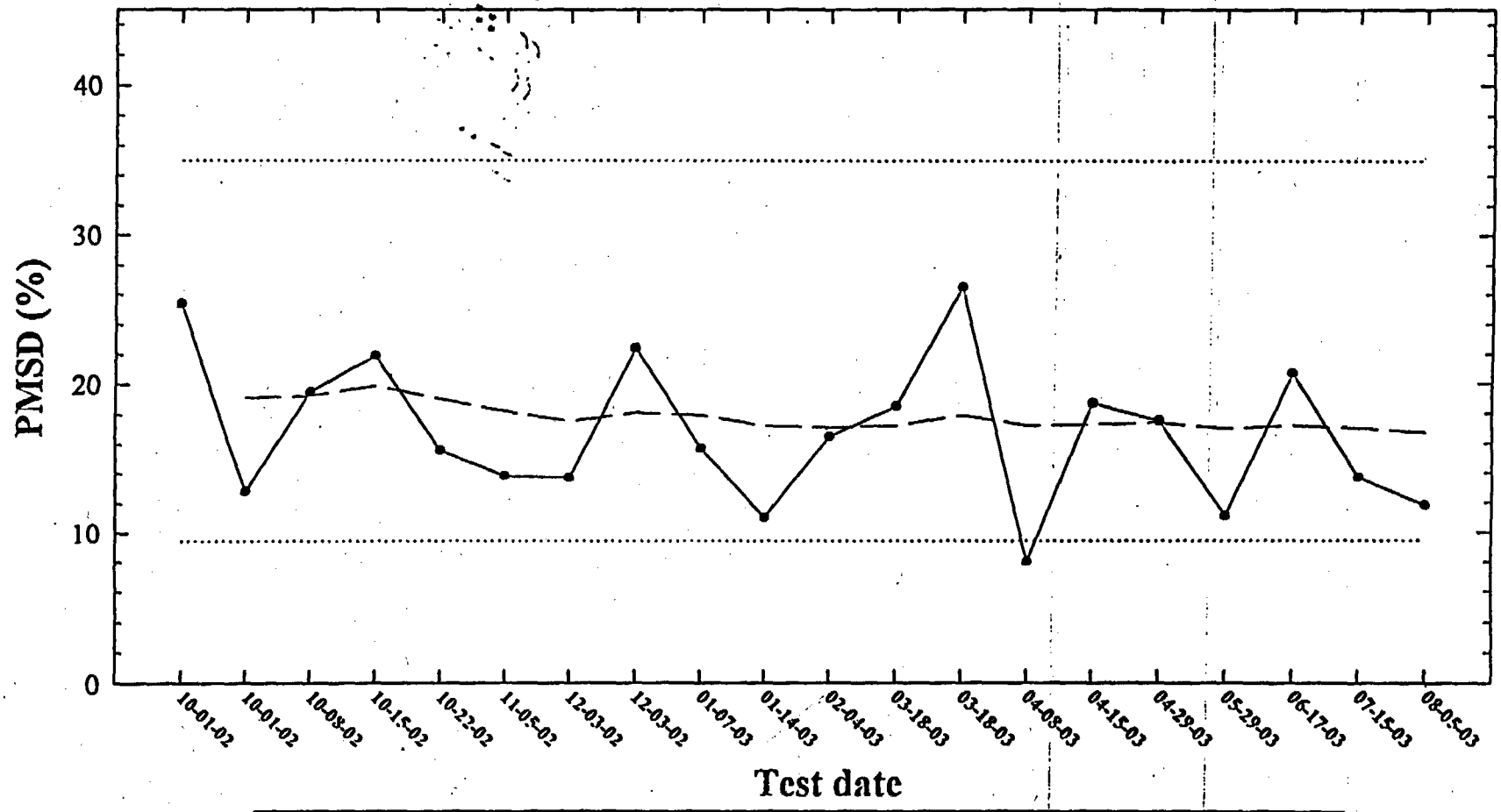
Central Tendency (mean Control Growth or CV)

Control Limits (mean Control Growth or CV ± 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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 (10th percentile) = 9.4%, Upper PMSD Bound (90th percentile) = 35%

(Lower and upper PMSD bounds were determined by USEPA for the method and endpoint.)

Environmental Testing Solutions, Inc.

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: PpKClCR # 53

Test dates: August 5-12, 2003

Reviewed by:

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) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15.119	25.700	10.581	1.0581	97.5	1.0919	6.5	Not applicable
	B	10	10	14.893	26.880	11.987	1.1987				
	C	10	9	15.129	25.730	10.601	1.0601				
	D	10	10	14.724	25.230	10.506	1.0506				
300	E	10	10	14.681	25.250	10.569	1.0569	100.0	0.9840	9.2	9.9
	F	10	10	14.600	23.110	8.510	0.8510				
	G	10	10	15.205	25.390	10.185	1.0185				
	H	10	10	15.156	25.250	10.094	1.0094				
450	I	10	10	15.253	24.750	9.497	0.9497	100.0	0.9542	4.4	12.6
	J	10	10	14.989	25.090	10.101	1.0101				
	K	10	10	14.692	23.770	9.078	0.9078				
	L	10	10	14.718	24.210	9.492	0.9492				
600	M	10	8	14.754	21.480	6.726	0.6726	80.0	0.7082	14.1	35.1
	N	10	7	14.795	21.920	7.125	0.7125				
	O	10	7	14.988	21.040	6.052	0.6052				
	P	10	10	14.867	23.290	8.423	0.8423				
750	Q	10	4	14.888	17.920	3.032	0.3032	45.0	0.2936	15.4	73.1
	R	10	6	14.682	17.680	2.998	0.2998				
	S	10	5	15.102	18.500	3.398	0.3398				
	T	10	3	15.054	17.370	2.316	0.2316				
900	U	10	2	15.096	16.370	1.274	0.1274	7.5	0.0369	165.4	96.6
	V	10	0	0.000	0.000	0.000	0.0000				
	W	10	1	15.087	15.290	0.203	0.0203				
	X	10	0	0.000	0.000	0.000	0.0000				

Dunnett's MSD value: 0.1283
PMSD: 11.8

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, Inc. chronic toxicity tests when a toxicant reduces Pimephales growth by 16.7% 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.

Organisms obtained from Aquatic BioSystems, Inc.

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

PpKClCR Test Number: 13

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:	25 TO 27.5 HOURS OLD	Randomizing template:	PURPLE
Date and times organisms were born between:	08-04-03 1100 TO 1330 MDT	Incubator number:	3
Organism source:	ABS BATCH 08-04-03	*Artemia* lot number:	BG-0403Q
Transfer bowl information:	pH = 7.80 Temperature = 24.6 °C	Total drying time:	18 HOURS
		Date / Time in: 08-12-03	1500
Average transfer volume:	10.4 ml	Date / Time out: 08-13-03	0800
		Oven temperature:	101°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used HHS	Analyst
0	08-05-03	[illegible]	1550	1215	08-01-03	JI
1	08-06-03	0900	1500	1206	08-01-03	JI
2	08-07-03	0900	1500	1150	08-01-03	JI
3	08-08-03	0917	1520	1200	08-06-03	JI
4	08-09-03	0856	1500	1202	08-08-03	JI
5	08-10-03	0900	1505	1214	08-08-03	JI
6	08-11-03	0853	1500	1156	08-08-03	JI
7	08-12-03			1126		JI

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC_{50}	716.2
Average weight per initial larvae:	1.0919		NOEC	300
Average weight per surviving larvae:	1.1213	≥ 0.25 mg/larvae	LOEC	450
			ChV	367.4
			IC_{25}	532.5

PpKClCR Test Number: 13

Survival and Growth Data

Day	CONTROL				300 mg KCl/L				450 mg KCl/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	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	9 1d	10	10	10	10	10	10	10	10	10
7	10	10	9	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray	15.119	14.893	15.129	14.724	14.681	14.600	15.205	15.156	15.253	14.989	14.692	14.718
B = Pan + Larvae weight (mg)	25.70	26.88	25.73	25.23	25.25	23.11	25.39	25.25	24.75	25.09	23.77	24.21
C = Larvae weight (mg) = A – B	10.581	11.987	10.601	10.506	10.569	8.510	10.185	10.094	9.497	10.101	9.078	9.492
Weight per initial number of larvae (mg) = C / Initial number of larvae	1.0581	1.1987	1.0601	1.0506	1.0569	0.8510	1.0185	1.0094	0.9497	1.0101	0.9078	0.9492
Average weight per initial number of larvae (mg)	1.0919				0.9840				0.9542			

Calculations and data reviewed: [illegible]

Comments:

PpKClCR Test Number: 13

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/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	10	9 1d	9 1d	7 3d	6 4d	4 6d	3 7d	3 7d	6 4d
2	10	9 1d	10	10	7 2d	9	7	5 4d	3 1d	2 2d	3	2 4d
3	10	9	10	10	6 1d	8 1d	7	5	2 1d	2	3	2
4	10	7 2d	9 1d	10	4 2d	8	5 2d	5	2	1 1d	3	1 1d
5	10	7	7 2d	10	4	8	5	5	2	0 1d	2 1d	0 1d
6	9 1d	~~10 1d~~ 7	~~10 1d~~ 7	10	4 2d ~~3~~	~~4 1d~~ 6 2d	5	3 2d	2	0	2	0
7	8 1d	7	7	10	4	6	5	3	2	0	1 1d	0
A = Pan weight (mg)	14.754	14.795	14.988	14.867	14.888	14.682	15.102	15.054	15.096	~~15.044~~ —	15.087	~~15.102~~ —
B = Pan + Larvae weight (mg)	21.48	21.92	21.04	23.29	17.92	17.68	18.50	17.37	16.37	—	15.29	—
Larvae weight (mg) = A – B	6.726	7.125	6.052	8.423	3.032	2.998	3.398	2.316	1.274	—	0.203	—
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.6726	0.7125	0.6052	0.8423	0.3032	0.2998	0.3398	0.2316	0.1274	0	0.0203	0
Average weight per initial number of larvae (mg)	0.7082				0.2936				0.0369			

Calculations and data reviewed: [illegible]

Comments:

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	8/5/03	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	8/12/03	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	CHRONIC-(EPA-821-R-02-013)	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	0.9000	1.0000
300	1.0000	1.0000	1.0000	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	0.8000	0.7000	0.7000	1.0000
750	0.4000	0.6000	0.5000	0.3000
900	0.2000	0.0000	0.1000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			1	40
300	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
450	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
600	0.8000	0.8205	1.1254	0.9912	1.4120	17.662	4	12.50	10.00	8	40
*750	0.4500	0.4615	0.7340	0.5796	0.8861	17.942	4	10.00	10.00	22	40
*900	0.0750	0.0769	0.2757	0.1588	0.4636	53.294	4	10.00	10.00	37	40

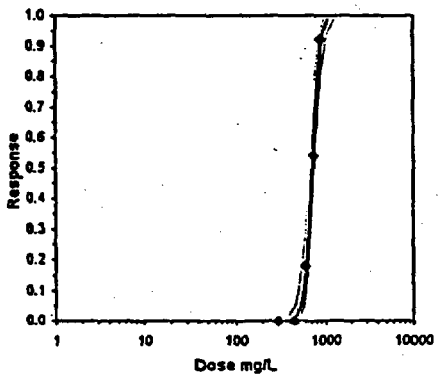
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.897649825	0.884	0.830951952	1.320318533
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.8203932	
Treatments vs D-Control				

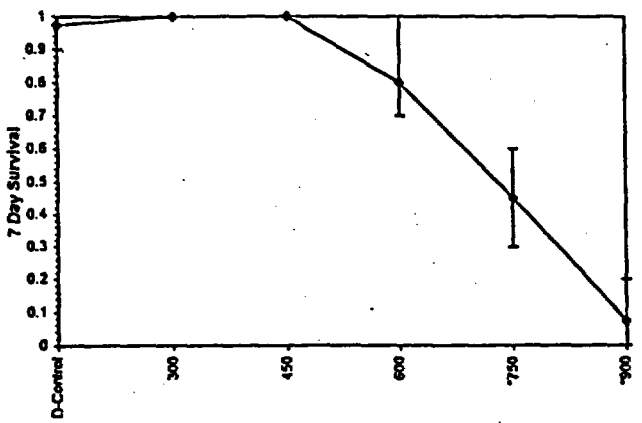
Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	13.09419594	2.032639116	9.110223195	17.07816869	0.025	1.991210439	7.814724922	0.57	2.855052487	0.076369714	6
Intercept	-32.3846167	5.82131626	-43.7947883	-20.9744446							
TSCR	0.008763746	0.00923663	-0.00934005	0.026867541							

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	475.7622334	390.4425536	530.686537
EC05	3.355	536.3341931	462.5037421	583.4314204
EC10	3.718	571.7165463	505.7319813	614.2371026
EC15	3.964	596.8983363	536.8008389	636.3584859
EC20	4.158	617.7007318	562.5205614	654.888877
EC25	4.326	636.1241709	585.2249964	671.606509
EC40	4.747	685.0218783	644.1088214	718.3989771
EC50	5.000	716.2299676	679.5290178	751.208692
EC60	5.253	748.859835	713.8543012	788.865018
EC75	5.674	806.4233168	767.7689619	863.5130443
EC80	5.842	830.475572	788.4176906	897.1702224
EC85	6.038	859.4183363	812.2918745	939.0962466
EC90	6.282	897.2721808	842.3633979	995.8209169
EC95	6.645	956.4658764	887.6252999	1087.933781
EC99	7.326	1078.239001	976.6395442	1287.679427



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

08-05-03 xls

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	8/5/03	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	8/12/03	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	CHRONIC-(EPA-821-R-02-013)	Test Species:	PP-Pimephales promelas

Comments:

Conc-mg/L	1	2	3	4
D-Control	1.0581	1.1987	1.0601	1.0506
300	1.0569	0.8510	1.0185	1.0094
450	0.9497	1.0101	0.9078	0.9492
600	0.6726	0.7125	0.6052	0.8423
750	0.3032	0.2998	0.3398	0.2316
900	0.1274	0.0000	0.0203	0.0000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.0919	1.0000	1.0919	1.0506	1.1987	6.533	4				1.0919	1.0000
300	0.9840	0.9012	0.9840	0.8510	1.0569	9.248	4	1.927	2.290	0.1283	0.9840	0.9012
*450	0.9542	0.8739	0.9542	0.9078	1.0101	4.414	4	2.458	2.290	0.1283	0.9542	0.8739
*600	0.7082	0.6486	0.7082	0.6052	0.8423	14.092	4	6.850	2.290	0.1283	0.7082	0.6486
750	0.2936	0.2689	0.2936	0.2316	0.3398	15.370	4				0.2936	0.2689
900	0.0369	0.0338	0.0369	0.0000	0.1274	165.392	4				0.0369	0.0338

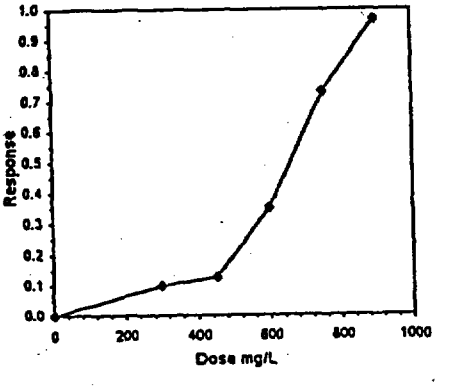
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.976972163	0.844	0.112846245	-0.03144984
Bartlett's Test indicates equal variances (p = 0.59)	1.93307364	11.34488201		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	300	450	367.4234614		0.128274997	0.117481394	0.105112797	0.006275424	1.4E-04	3, 12
Treatments vs D-Control										

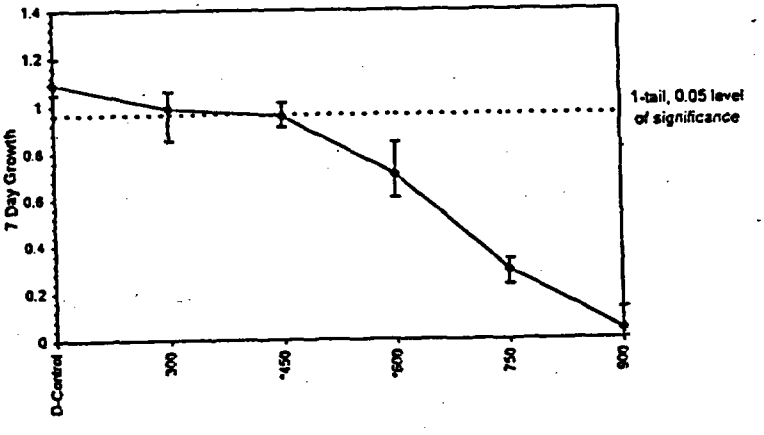
Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	151.75	79.48	54.27	487.78	1.1293
IC10	306.37	93.77	106.83	560.02	0.0599
IC15	465.92	63.55	156.43	518.73	-1.8820
IC20	499.20	21.99	437.72	558.81	-0.8780
IC25	532.48	23.66	471.92	612.51	0.4399
IC40	619.19	15.84	571.17	659.17	-0.3130
IC50	658.69	11.70	623.21	686.87	-0.2496

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

08-05-03.xls

PpKClCR Test Number: 13

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
						7.49	
CONTROL	pH (S.U.)	7.82	7.39	7.63	7.24	7.35	7.24
	DO (mg/L)	7.8	7.6		7.3	7.6	7.4
	Conductivity (µmhos/cm)	321		311		310	
	Alkalinity (mg $CaCO_3$/L)	59					
	Hardness (mg $CaCO_3$/L)	86					
	Temperature (°C)	25.1	25.1	25.0	25.0	25.1	25.2
300 mg KCl/L	pH (S.U.)	7.78	7.46	7.62	7.36	7.55	7.39
	DO (mg/L)	7.8	7.6	8.0	7.4	7.6	7.2
	Conductivity (µmhos/cm)	862		848		838	
	Temperature (°C)	25.1	25.1	25.0	25.0	25.1	25.2
450 mg KCl/L	pH (S.U.)	7.79	7.49	7.66	7.40	7.55	7.46
	DO (mg/L)	7.9	7.6	8.0	7.4	7.7	7.2
	Conductivity (µmhos/cm)	1130		1119		1128	
	Temperature (°C)	25.1	25.1	25.0	25.0	25.2	25.2
600 mg KCl/L	pH (S.U.)	7.80	7.54	7.68	7.43	7.60	7.44
	DO (mg/L)	7.9	7.6	8.0	7.3	7.6	7.2
	Conductivity (µmhos/cm)	1397		1385		1394	
	Temperature (°C)	25.1	25.1	25.0	25.0	25.2	25.2
750 mg KCl/L	pH (S.U.)	7.80	7.57	7.70	7.47	7.63	7.49
	DO (mg/L)	8.0	7.7	8.0	7.4	7.6	7.2
	Conductivity (µmhos/cm)	1650		1653		1630	
	Temperature (°C)	25.1	25.1	25.0	25.0	25.2	25.2
900 mg KCl/L	pH (S.U.)	7.81	7.60	7.71	7.55	7.66	7.55
	DO (mg/L)	7.8	7.7	8.0	7.4	7.6	7.3
	Conductivity (µmhos/cm)	1874		1884		1877	
	Temperature (°C)	25.1	25.1	25.0	25.0	25.2	25.2
		Initial	Final	Initial	Final	Initial	Final

Stock 33048

Stock 32538

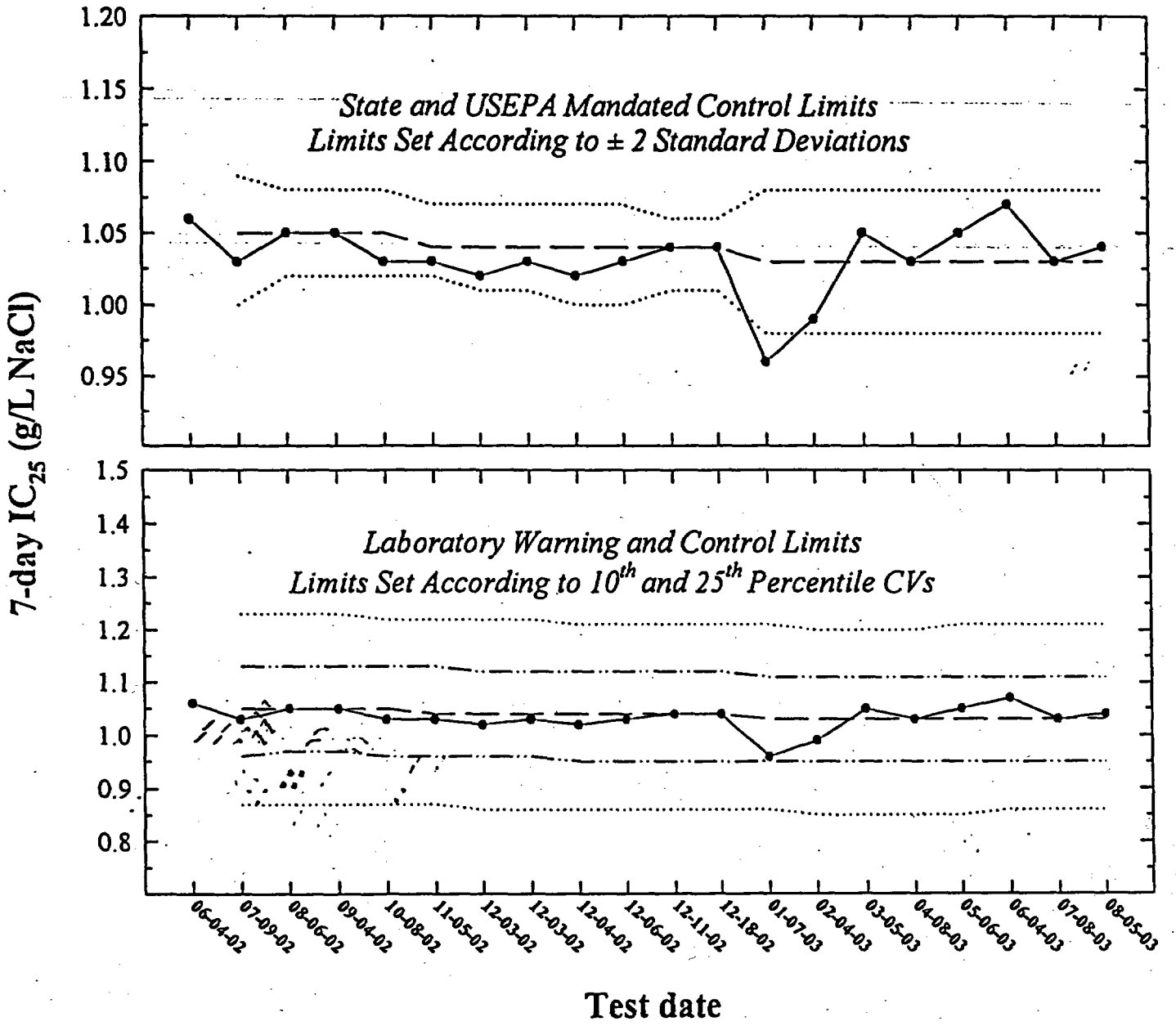
PpKClCR Test Number: 13

Concentration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
CONTROL	pH (S.U.)	7.68	7.35	7.62	7.13	7.39	8.01	8.04	7.81
	DO (mg/L)	7.6	7.4	7.6	7.1	7.9	7.7	7.5	7.5
	Conductivity (µmhos/cm)	315		303		302		312	
	Alkalinity (mg $CaCO_3$/L)	61		60					
	Hardness (mg $CaCO_3$/L)	88		84					
	Temperature (°C)	25.2	24.9	25.3	25.1	25.4	24.8	25.1	25.6
300 mg KCl/L	pH (S.U.)	7.68	7.46	7.71	7.19	7.49	7.93	8.01	7.80
	DO (mg/L)	7.6	7.4	7.6	7.0	7.8	7.7	7.5	7.5
	Conductivity (µmhos/cm)	828		873		849		879	
	Temperature (°C)	25.2	24.9	25.3	25.1	25.4	24.8	25.1	25.6
450 mg KCl/L	pH (S.U.)	7.69	7.49	7.72	7.26	7.55	7.87	8.00	7.78
	DO (mg/L)	7.7	7.4	7.6	6.9	7.8	7.4	7.7	7.5
	Conductivity (µmhos/cm)	1141		1134		1116		1164	
	Temperature (°C)	25.2	24.9	25.3	25.1	25.4	24.8	25.1	25.6
600 mg KCl/L	pH (S.U.)	7.72	7.51	7.74	7.28	7.60	7.90	8.01	7.77
	DO (mg/L)	7.6	7.4	7.6	6.9	7.8	7.6	7.8	7.5
	Conductivity (µmhos/cm)	1409		1427		1397		1429	
	Temperature (°C)	25.2	24.9	25.3	25.1	25.4	24.8	25.1	25.6
750 mg KCl/L	pH (S.U.)	7.73	7.56	7.74	7.32	7.602	7.90	8.00	7.80
	DO (mg/L)	7.6	7.4	7.8	6.9	7.8	7.6	7.8	7.5
	Conductivity (µmhos/cm)	1639		1641		1620		1654	
	Temperature (°C)	25.2	24.9	25.3	25.1	25.4	24.8	25.1	25.6
900 mg KCl/L	pH (S.U.)	7.74	7.59	7.75	7.39	7.660	7.93	7.99	7.84
	DO (mg/L)	7.6	7.5	7.7	7.1	7.8	7.6	7.8	7.6
	Conductivity (µmhos/cm)	1895		1912		1873		1936	
	Temperature (°C)	25.2	24.9	25.3	25.1	25.4	24.8	25.1	25.6

Stock 32000 32300

Environmental Testing Solutions, Inc.

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 $IC_{25} \pm S_{A.10}$)

····· Control Limits (mean $IC_{25} \pm S_{A.25}$ or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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

Test number	Test date	7-day IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	06-04-02	1.06																	
2	07-09-02	1.03	1.05	0.02	1.00	1.09	0.08	0.96	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.02
3	08-06-02	1.05	1.05	0.02	1.02	1.08	0.08	0.97	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.01
4	09-04-02	1.05	1.05	0.01	1.02	1.08	0.08	0.97	1.13	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.01
5	10-08-02	1.03	1.05	0.02	1.02	1.08	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.52	0.65	0.40	1.69	0.01
6	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
7	12-03-02	1.02	1.04	0.02	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	1.68	0.02
8	12-03-02	1.03	1.04	0.02	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
9	12-04-02	1.02	1.04	0.02	1.00	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	0.02
10	12-06-02	1.03	1.04	0.02	1.00	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
11	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
12	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
13	01-07-03	0.96	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
14	02-04-03	0.99	1.03	0.03	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	1.66	0.03
15	03-05-03	1.05	1.03	0.03	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	0.03
16	04-08-03	1.03	1.03	0.03	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	05-06-03	1.05	1.03	0.02	0.98	1.08	0.08	0.95	1.11	0.18	0.85	1.21	0.46	0.57	1.49	0.64	0.39	1.67	0.02
18	06-04-03	1.07	1.03	0.03	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
19	07-08-03	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	1.50	0.64	0.39	1.67	0.02
20	08-05-03	1.04	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

Note: 7-d IC_{25} = 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_{25}).

S = Standard deviation of the IC_{25} values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC_{25} 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.

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. ($S_{A.10}$ = 0.08)

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. ($S_{A.25}$ = 0.17)

USEPA Control and Warning Limits

$S_{A.75}$ = Standard deviation corresponding to the 75th percentile CV. ($S_{A.75}$ = 0.45)

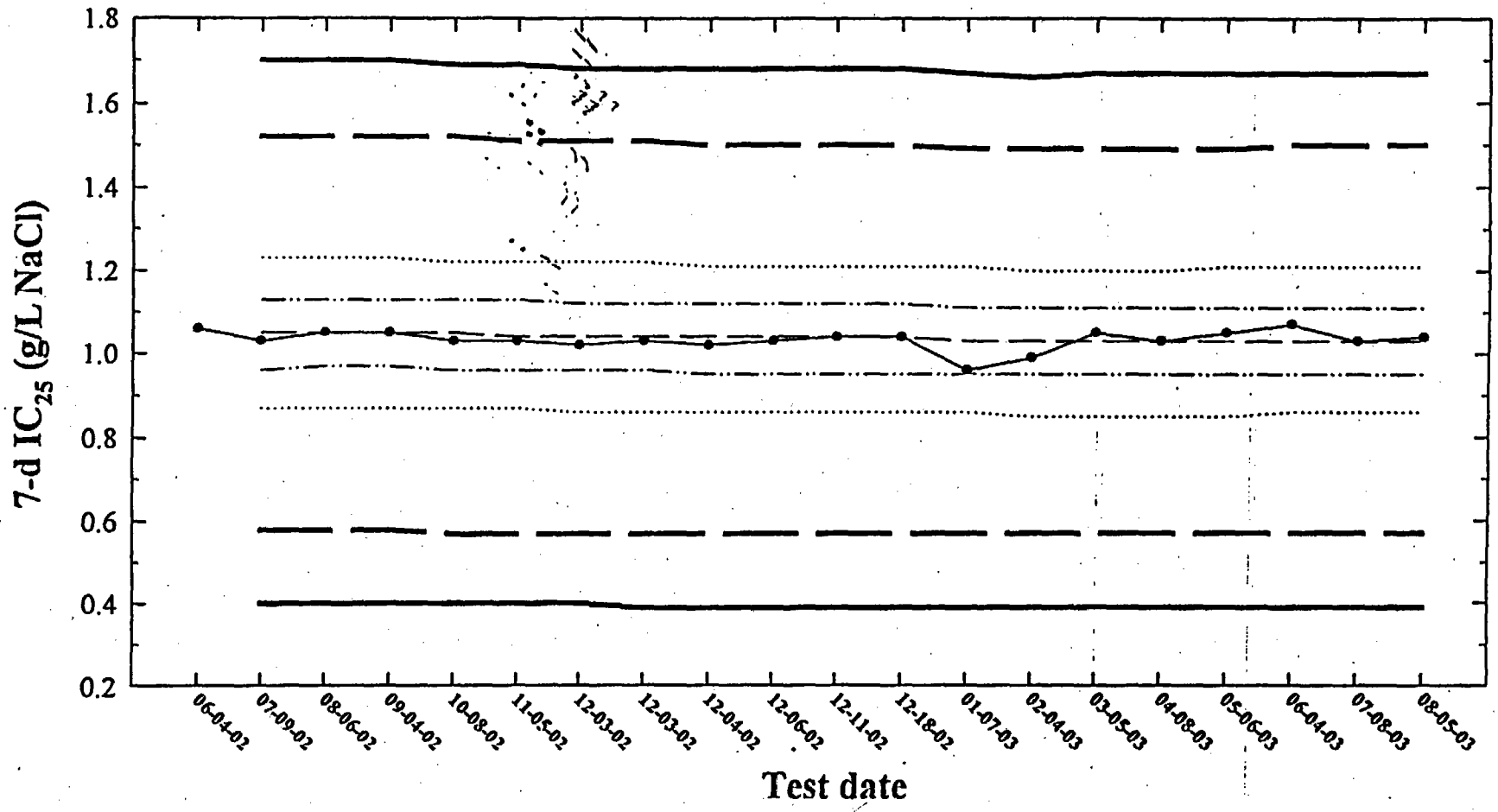
$S_{A.90}$ = Standard deviation corresponding to the 90th percentile CV. ($S_{A.90}$ = 0.62)

CV = Coefficient of variation of the IC_{25} 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, Inc.

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})

—··— Laboratory Warning Limits (mean $IC_{25} \pm S_{A.10}$, $S_{A.10} = 0.08$)

····· Laboratory Control Limits (mean $IC_{25} \pm S_{A.25}$, $S_{A.25} = 0.17$)

— — USEPA Warning Limits (mean $IC_{25} \pm S_{A.75}$, $S_{A.75} = 0.45$)

——— USEPA Control Limits (mean $IC_{25} \pm S_{A.90}$, $S_{A.90} = 0.62$)

Environmental Testing Solutions, Inc.

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	06-04-02	100	26.0		8.1		3.8	14.7	
2	07-09-02	100	29.5	27.8	9.9	9.0	3.5	11.7	13.2
3	08-06-02	100	28.4	28.0	8.0	8.7	2.7	9.5	11.9
4	09-04-02	100	31.4	28.8	10.4	9.1	3.0	9.5	11.3
5	10-08-02	100	31.1	29.3	6.7	8.6	2.9	9.4	10.9
6	11-05-02	100	29.5	29.3	9.2	8.7	2.5	8.4	10.5
7	12-03-02	90	34.0	30.0	8.0	8.6	2.7	8.0	10.2
8	12-03-02	100	33.2	30.4	6.2	8.3	3.3	9.9	10.1
9	12-04-02	100	32.5	30.6	6.0	8.1	3.2	9.8	10.1
10	12-06-02	100	29.7	30.5	11.0	8.4	3.0	10.0	10.1
11	12-11-02	100	33.8	30.8	13.7	8.8	2.9	8.5	9.9
12	12-18-02	100	30.5	30.8	7.4	8.7	2.9	9.4	9.9
13	01-07-03	100	33.2	31.0	7.0	8.6	2.9	8.6	9.8
14	02-04-03	100	32.3	31.1	8.1	8.5	2.7	8.4	9.7
15	03-05-03	100	28.7	30.9	5.1	8.3	3.5	12.1	9.9
16	04-11-03	100	26.3	30.6	6.2	8.2	2.5	9.6	9.8
17	05-06-03	100	27.6	30.5	10.8	8.3	3.2	11.5	9.9
18	06-04-03	100	25.9	30.2	5.9	8.2	2.6	10.1	9.9
19	07-08-03	100	29.0	30.1	11.6	8.4	3.2	10.9	10.0
20	08-05-03	100	33.3	30.3	6.6	8.3	4.7	14.1	10.2

Note:

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 8.3% in Environmental Testing Solutions, Inc. *Ceriodaphnia* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th 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, Inc. chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 10.2% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

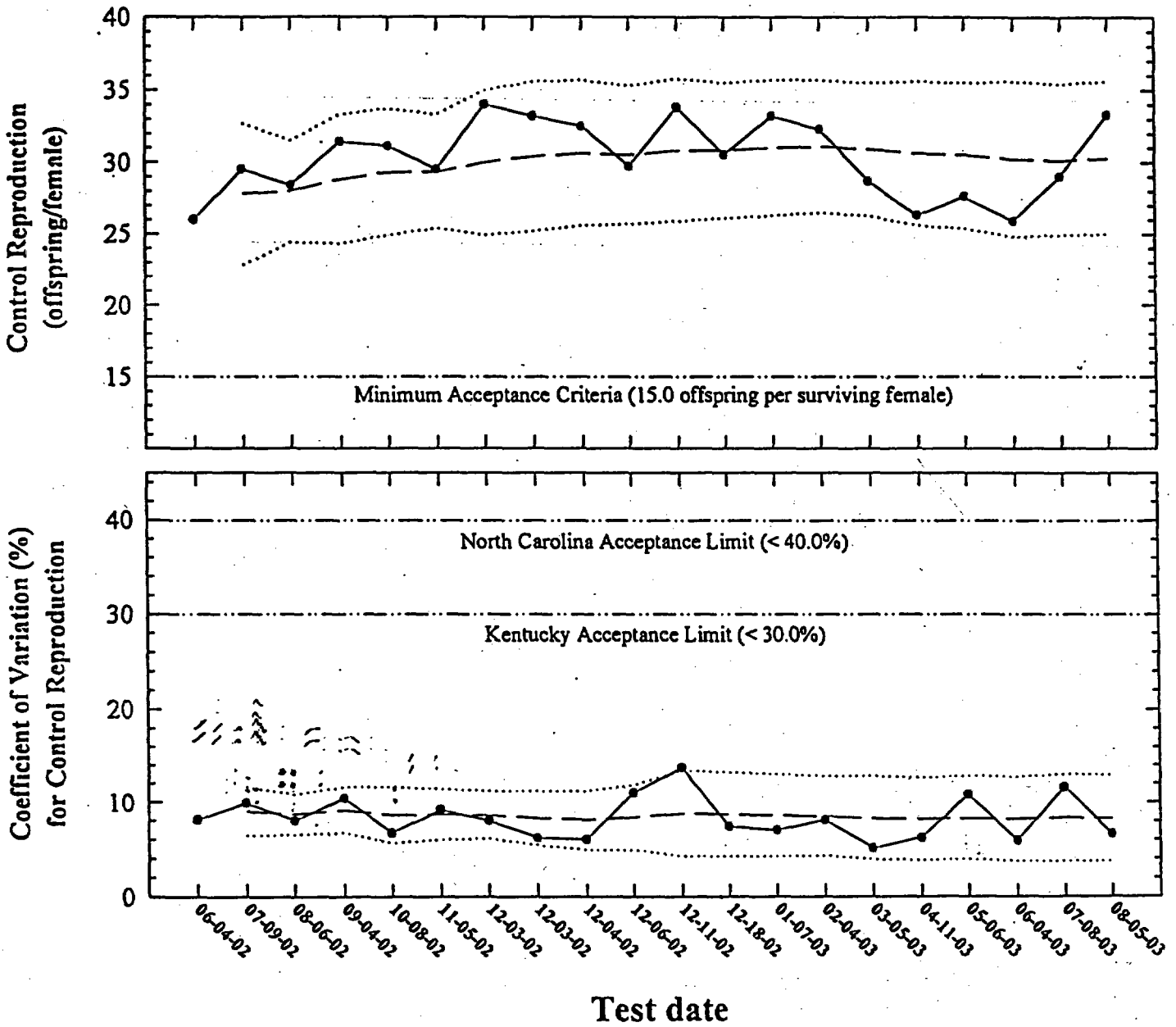
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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, Inc.

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



—•— Control Reproduction or Coefficient of Variation (CV)

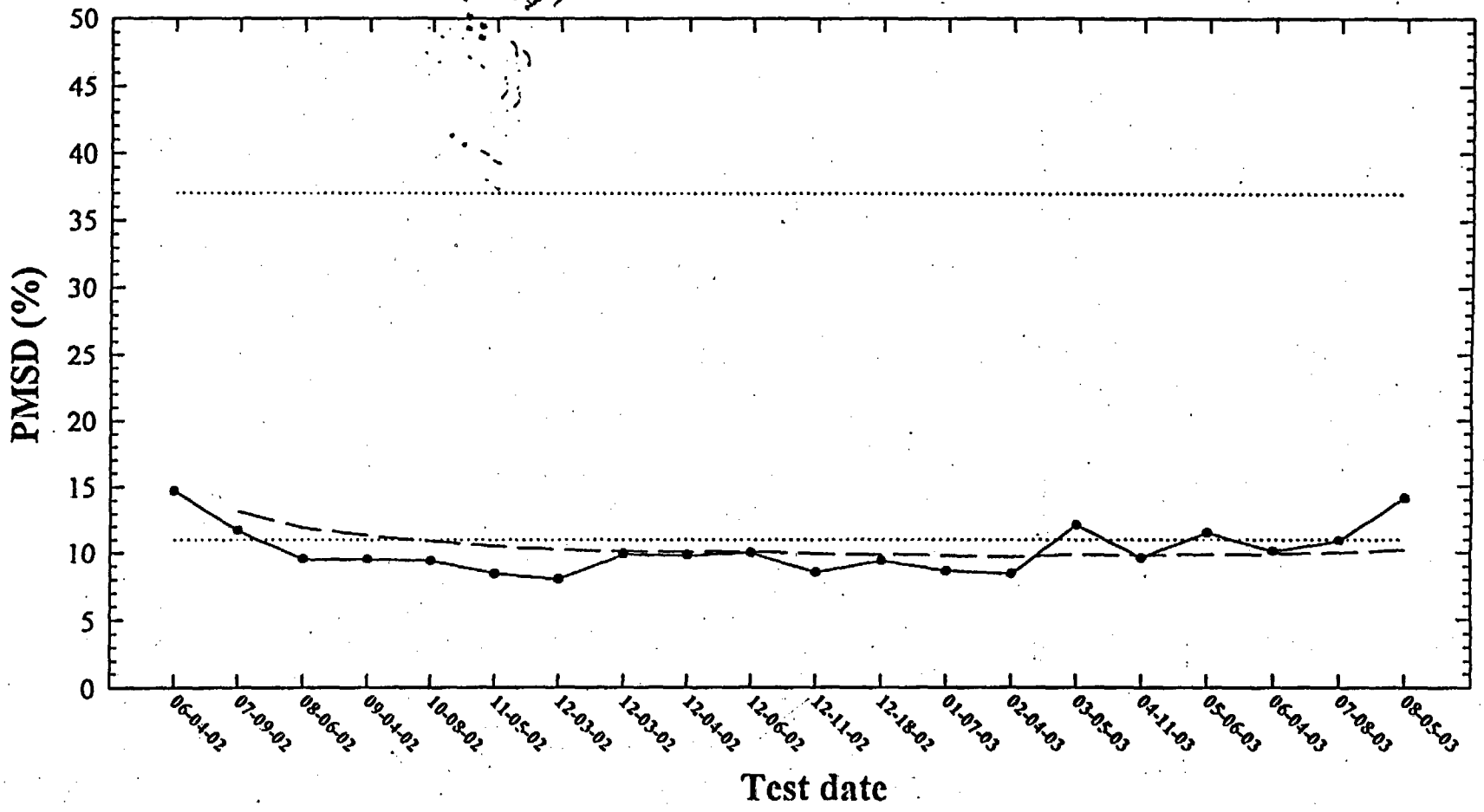
— — Central Tendency (mean Control Reproduction or CV)

····· Control Limits (mean Control Reproduction or CV ± 2 Standard Deviations)

Environmental Testing Solutions, Inc.

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 (10th percentile) = 11%, Upper PMSD Bound (90th 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 #: 13

Dilution preparation information:						*Comments:*
NaCl CHM number:		CHM 060				
Stock preparation:		100 g NaCl/l (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:	Yellow
Date and times organisms were born between:	08-05-03 0832 TO 1100	Incubator number and shelf location:	2
Organism source:	07-29-03 A-F	YCT batch: ABS	07-22-03
Transfer bowl information:	pH = 7.85 Temperature = 25.0	*Selenastrum* batch: ABS	07-22-03

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHS	Analyst
0	08-05-03	1354	08-01-03	JL
1	08-06-03	1300	08-01-03	JL
2	08-07-03	1303	08-01-03	JL
3	08-08-03	1305	08-06-03	JL
4	08-09-03	1300	08-08-03	JL
5	08-10-03	1305	08-08-03	JL
6	08-11-03	1300	08-08-03	JL
7	08-12-03	1320	JL	JL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	> 1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	33.3	≥ 15.0 offspring/female	ChV	894.4
% CV:	6.6%	< 40.0 %	IC25	1036.3

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 13

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	4	6	4	5	4	3	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12**	14**	12**	12**	0	14**	13**	14**	13**	13**
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	15	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	15	14	16	15	12	18	16	16	15
Total young produced		34	35	30	33	34	29	36	35	34	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.3

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	5	4	4	6	4	4	5	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	16**	0	12**	0	0	15**	13**	14**	12**	14**
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	11	0	13	12	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	14	13	17	15	13	16	17	17
Total young produced		36	30	30	32	33	34	31	35	33	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.0
% Reduction from Control:	0.9%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 13

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	4	5	5	5	4	6	4	4	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12**	0	1	0	0	12**	13**	11**	12**	14**
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	14	12	12	13	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	14	16	14	13	14	17	18	17	14
Total young produced		31	33	34	31	30	32	34	33	33	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.2
% Reduction from Control:	3.3%

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	5	3	4	5	5	4	4	6	3	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	12**	0	0	0	0	13**	14**
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	12	13	0	10	12	10	13	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	11	11	6	13	10	15	10	14	12	10
Total young produced		30	26	23	30	25	31	24	33	28	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	27.9
% Reduction from Control:	16.2%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 13

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	3	1	3	0	4	3	0	2	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	3	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	8	2	7	0	0	3	7	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	12	11	0	10	0	0	0	11	8	2
Total young produced		26	22	3	~~18~~ 20	0	7	6	18	14	2
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	11.8
% Reduction from Control:	64.6%

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	~~2~~ 0	~~7~~ 2	~~1~~ 0	~~3~~ 2	2	4	2	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	0	0	0	0	1	0	1	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	5	3	3	2	4	0	3	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	3	0	2	4	9	4	8	0
Total young produced		9	5	6	4	8	9	14	5	11	0
Final Adult Mortality		L	L	L	L	L	L	L	D	L	L

Concentration:	
% Mortality:	10%
Mean Offspring/Female:	7.1
% Reduction from Control:	78.7%

Environmental Testing Solutions, Inc.

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	4	6	4	5	4	3	5	5	5	5	46
5	12	14	12	12	0	14	13	14	13	13	117
6	0	0	0	0	15	0	0	0	0	0	15
7	18	15	14	16	15	12	18	16	16	15	155
Total	34	35	30	33	34	29	36	35	34	33	333

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	5	3	4	5	5	4	4	6	3	5	44
5	0	0	0	12	0	0	0	0	13	14	39
6	14	12	13	0	10	12	10	13	0	0	84
7	11	11	6	13	10	15	10	14	12	10	112
Total	30	26	23	30	25	31	24	33	28	29	279

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	5	4	4	6	4	4	5	5	4	5	46
5	16	0	12	0	0	15	13	14	12	14	96
6	0	11	0	13	12	0	0	0	0	0	36
7	15	15	14	13	17	15	13	16	17	17	152
Total	36	30	30	32	33	34	31	35	33	36	330

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	3	1	3	0	4	3	0	2	0	18
5	0	0	0	0	0	3	0	0	0	0	3
6	12	8	2	7	0	0	3	7	4	0	43
7	12	11	0	10	0	0	0	11	8	2	54
Total	26	22	3	20	0	7	6	18	14	2	118

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	4	5	5	5	4	6	4	4	4	3	44
5	12	0	1	0	0	12	13	11	12	14	75
6	0	14	12	12	13	0	0	0	0	0	51
7	15	14	16	14	13	14	17	18	17	14	152
Total	31	33	34	31	30	32	34	33	33	31	322

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	0	2	0	2	2	4	2	0	0	0	12
5	4	0	0	0	0	1	0	1	3	0	9
6	5	3	3	2	4	0	3	0	0	0	20
7	0	0	3	0	2	4	9	4	8	0	30
Total	9	5	6	4	8	9	14	5	11	0	71

Environmental Testing Solutions, Inc.

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 #42

Test dates: August 5-12, 2003

Reveiwed by: [illegible]

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	34	35	30	33	34	29	36	35	34	33	100	33.3	6.6	Not applicable
600	36	30	30	32	33	34	31	35	33	36	100	33.0	6.9	0.9
800	31	33	34	31	30	32	34	33	33	31	100	32.2	4.3	3.3
1000	30	26	23	30	25	31	24	33	28	29	100	27.9	11.8	16.2
1200	26	22	3	20	0	7	6	18	14	2	100	11.8	79.2	64.6
1400	9	5	6	4	8	9	14	5	11	0	90	7.1	55.7	78.7

Dunnett's MSD value: 4.68

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, Inc. chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 10.2% from the control.

Lower PMSD bound determined by USEPA (10th percentile) = 11%.

Upper PMSD bound determined by USEPA (90th 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, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	8/5/03	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	8/12/03	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	34.000	35.000	30.000	33.000	34.000	29.000	36.000	35.000	34.000	33.000
600	36.000	30.000	30.000	32.000	33.000	34.000	31.000	35.000	33.000	36.000
800	31.000	33.000	34.000	31.000	30.000	32.000	34.000	33.000	33.000	31.000
1000	30.000	26.000	23.000	30.000	25.000	31.000	24.000	33.000	28.000	29.000
1200	26.000	22.000	3.000	20.000	0.000	7.000	6.000	18.000	14.000	2.000
1400	9.000	5.000	6.000	4.000	8.000	9.000	14.000	5.000	11.000	0.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	33.300	1.0000	33.300	29.000	36.000	6.647	10			33.300	1.0000
600	33.000	0.9910	33.000	30.000	36.000	6.851	10	100.50	75.00	33.000	0.9910
800	32.200	0.9670	32.200	30.000	34.000	4.343	10	84.50	75.00	32.200	0.9670
*1000	27.900	0.8378	27.900	23.000	33.000	11.761	10	63.50	75.00	27.900	0.8378
*1200	11.800	0.3544	11.800	0.000	26.000	79.177	10	55.00	75.00	11.800	0.3544
*1400	7.100	0.2132	7.100	0.000	14.000	55.728	10	55.00	75.00	7.100	0.2132

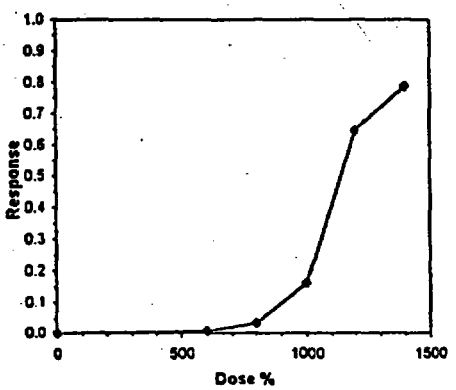
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.97553444	1.035	0.21611605	2.02911317
Bartlett's Test indicates unequal variances (p = 8.96E-08)	41.0995598	15.0863171		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	800	1000	894.427191	0.125

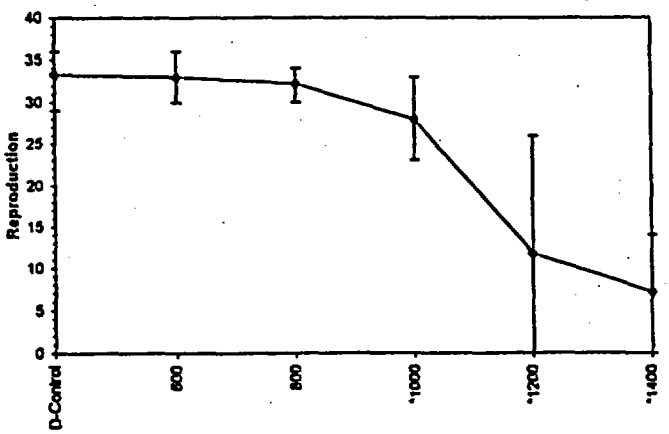
Treatments vs D-Control

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL		Skew
IC05	826.27907	79.4249321	533.565789	873.421007	-2.3510
IC10	903.72093	37.9833404	842.853896	997.016043	0.6377
IC15	981.162791	33.737917	912.348214	1018.65158	-0.2947
IC20	1015.65217	18.6163229	965.386416	1040.63562	-0.9555
IC25	1036.3354	14.1638132	1009.57693	1064.4345	0.1122
IC40	1098.38509	21.0037292	1070.16427	1154.35428	1.0088
IC50	1139.75155	27.9547482	1102.25977	1214.10309	1.1163



Dose-Response Plot



Environmental Testing Solutions, Inc.
Statistical Analyses

Used for PMSD calculation only.			Ceriodaphnia Survival and Reproduction Test-Reproduction		
Start Date:	8/5/03	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	8/12/03	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	34.000	35.000	30.000	33.000	34.000	29.000	36.000	35.000	34.000	33.000
600	36.000	30.000	30.000	32.000	33.000	34.000	31.000	35.000	33.000	36.000
800	31.000	33.000	34.000	31.000	30.000	32.000	34.000	33.000	33.000	31.000
1000	30.000	26.000	23.000	30.000	25.000	31.000	24.000	33.000	28.000	29.000
1200	26.000	22.000	3.000	20.000	0.000	7.000	6.000	18.000	14.000	2.000
1400	9.000	5.000	6.000	4.000	8.000	9.000	14.000	5.000	11.000	0.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	33.300	1.0000	33.300	29.000	36.000	6.647	10			
600	33.000	0.9910	33.000	30.000	36.000	6.851	10	0.147	2.287	4.680
800	32.200	0.9670	32.200	30.000	34.000	4.343	10	0.537	2.287	4.680
*1000	27.900	0.8378	27.900	23.000	33.000	11.761	10	2.638	2.287	4.680
*1200	11.800	0.3544	11.800	0.000	26.000	79.177	10	10.504	2.287	4.680
*1400	7.100	0.2132	7.100	0.000	14.000	55.728	10	12.801	2.287	4.680

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.97553444	1.035	0.21611605	2.02911317
Bartlett's Test indicates unequal variances (p = 8.96E-08)	41.0995598	15.0863171		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191	0.125	4.6802761	0.14054883	1368.21667	20.9462963	1.1E-21	5, 54
Treatments vs D-Control										

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 13

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	7.82	7.55	7.63	7.65	7.49	7.57
	DO (mg/L)	7.8	7.9	7.8	7.8	7.6	7.7
	Conductivity (µmhos/cm)	321		311		310	
	Alkalinity (mg $CaCO_3$/L)	59					
	Hardness (mg $CaCO_3$/L)	86					
	Temperature (°C)	25.1	24.6	25.3	24.5	25.1	24.4
600 mg NaCl/L	pH (S.U.)	7.88	7.65	7.62	7.80	7.63	7.68
	DO (mg/L)	7.8	7.8	8.0	7.8	7.7	7.7
	Conductivity (µmhos/cm)	1416		1424		1401	
	Temperature (°C)	25.1	24.6	25.3	24.5	25.1	24.4
800 mg NaCl/L	pH (S.U.)	7.87	7.66	7.64	7.75	7.66	7.69
	DO (mg/L)	7.8	7.8	8.0	7.8	7.7	7.7
	Conductivity (µmhos/cm)	1796		1793		1780	
	Temperature (°C)	25.1	24.6	25.3	24.5	25.1	24.4
1000 mg NaCl/L	pH (S.U.)	7.87	7.67	7.66	7.74	7.65	7.71
	DO (mg/L)	7.8	7.8	8.0	7.8	7.7	7.7
	Conductivity (µmhos/cm)	2122		2122		2111	
	Temperature (°C)	25.1	24.6	25.3	24.5	25.1	24.4
1200 mg NaCl/L	pH (S.U.)	7.86	7.68	7.67	7.75	7.69	7.70
	DO (mg/L)	7.9	7.3	8.0	7.7	7.8	7.8
	Conductivity (µmhos/cm)	2468		2458		2438	
	Temperature (°C)	25.1	24.6	25.3	24.5	25.1	24.4
1400 mg NaCl/L	pH (S.U.)	7.86	7.67	7.67	7.73	7.69	7.76
	DO (mg/L)	7.8	7.8	8.0	7.7	7.7	7.7
	Conductivity (µmhos/cm)	2754		2764		2734	
	Temperature (°C)	25.1	24.6	25.3	24.5	25.1	24.4

Stock 45004

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 13

Concentration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
CONTROL	pH (S.U.)	7.68	7.59	7.67	7.53	7.39	8.05	8.04	7.92
	DO (mg/L)	7.6	7.7	7.6	7.7	7.9	7.7	7.5	7.7
	Conductivity (µmhos/cm)	315		303		302		312	
	Alkalinity (mg $CaCO_3$/L)	61		60					
	Hardness (mg $CaCO_3$/L)	88		84					
	Temperature (°C)	25.1	24.8	25.3	24.6	25.3	24.8	25.4	25.1
600 mg NaCl/L	pH (S.U.)	7.66	7.70	7.68	7.68	7.62	7.98	8.06	7.88
	DO (mg/L)	7.6	7.7	7.7	7.7	7.8	7.7	7.7	7.7
	Conductivity (µmhos/cm)	1387		1452		1402		1451	
	Temperature (°C)	25.1	24.8	25.3	24.6	25.3	24.8	25.4	25.1
800 mg NaCl/L	pH (S.U.)	7.69	7.72	7.68	7.67	7.67	7.95	7.99	7.87
	DO (mg/L)	7.6	7.7	7.7	7.7	7.9	7.7	7.8	7.7
	Conductivity (µmhos/cm)	1766		1799		1754		1822	
	Temperature (°C)	25.1	24.8	25.2	24.6	25.3	24.8	25.4	25.1
1000 mg NaCl/L	pH (S.U.)	7.71	7.74	7.69	7.70	7.66	7.96	7.98	7.86
	DO (mg/L)	7.7	7.8	7.7	7.8	7.9	7.7	7.9	7.7
	Conductivity (µmhos/cm)	2044		2184		2122		2204	
	Temperature (°C)	25.1	24.8	25.2	24.6	25.3	24.8	25.4	25.1
1200 mg NaCl/L	pH (S.U.)	7.71	7.78	7.70	7.75	7.67	7.95	7.97	7.85
	DO (mg/L)	7.7	7.8	7.7	7.8	7.9	7.8	7.9	7.7
	Conductivity (µmhos/cm)	2441		2524		2458		2565	
	Temperature (°C)	25.1	24.8	25.2	24.6	25.3	24.8	25.4	25.1
1400 mg NaCl/L	pH (S.U.)	7.70	7.87	7.71	7.78	7.67	7.94	7.96	7.86
	DO (mg/L)	7.8	7.9	7.8	7.9	7.9	7.8	7.9	7.8
	Conductivity (µmhos/cm)	2740		2854		2795		2915	
	Temperature (°C)	25.1	24.8	25.2	24.6	25.3	24.8	25.4	25.1

Stock 42500

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

ATTN: Stephanie A. Howard

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

TN0026450	101 Y
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	09	01	To	03	08	31

MAJOR
(SUBR 01)
F - FINAL
ANNUAL MONITORING (PCBS)
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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			
POLYCHLORINATED BIPHENYLS	SAMPLE MEASUREMENT	********	********	**	********	********	<0.0	19	0	1 / 365	GRAB
39521 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.0	MG/L		ANNUAL	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	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.	Stephanie A Howard Acting Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
Richard T. Purcell Site Vice President TYPED OR PRINTED			423	843-6700	03	09	10
			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

ATTN: Stephanie A. Howard

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

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE [ ] ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**	6.9	********	8.7	12	0	15 / 31	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	173	495	26	********	14	35	19	0	6 / 31	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	<59	<90	26	********	<5	<5	19	0	6 / 31	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	1.193	2.158	03	********	********	********	**	0	31 / 31	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			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	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.	Stephanie A Howard Acting Environmental Supervisor	423	843-6700	03	09	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

Turbine Building Sump was aligned to the Yard Pond on 8/28/03 @ 0730 and realigned to the LVWTP on 8/29/03 @ 1010.

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

ATTN: Stephanie A. Howard

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

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

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

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

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	********	********	**	8.8	********	9.0	12	0	9 / 31	GRAB
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	********	********	**	********	********	8	19	0	9 / 31	COMPOS
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********	<5	19	0	9 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********	<0.010	19	0	9 / 31	COMPOS
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********	0.33	19	0	9 / 31	COMPOS
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	0.040	0.043	03	********	********	********	**	0	9 / 31	CALCTD
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No phosphorous bearing cleaning solutions were used.

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

ATTN: Stephanie A. Howard

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

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

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			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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

ATTN: Stephanie A. Howard

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

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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 / 31	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 / 31	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			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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

ATTN: Stephanie A. Howard

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

TN0026450	117 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

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 / 31	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 / 31	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			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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

ATTN: Stephanie A. Howard

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

TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	03	08	01	To	03	08	31

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
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			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	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.