Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379-2000

December 13, 2004

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 NOVEMBER 2004

Enclosed is the November 2004 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
Principal Environmental Engineer
Signatory Authority for
J. Randy Douet
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

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	04	11	01	To	04	11	30

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	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
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	21.6	04	0	30 / 30	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	********	********	**	********	********	35.3	04	0	30 / 30	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	7.5	12	0	8 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	5	6	19	0	4 / 30	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 / 30	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	********	1490	03	********	********	********	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.015	<0.025	19	0	32 / 30	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		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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 0.049mg/L--limit 0.100mg/L) 2. PCL-222/PCL-401 (max. calc. conc. was 0.030mg/L--limit 0.100mg/L) 3. H-130M (max. calc. conc. was 0.043mg/L--limit 0.050mg/L) 4. H-130M (low detection level analytical method was <0.020mg/L--limit 0.050mg/L))

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	04	11	01	To	04	11	30

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			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.2	62	0	30 / 30	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	********	********	**	********	********	1.3	04	0	30 / 30	CALCTD
00016 1 W 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0	DEG. C.		CONTIN UOUS	CALCTD
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.2	<0.2	<0.2	19	0	1 / 30	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		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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)*

CCW data for November 2004 is attached.

CCW TRENCH

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
11/01/2004 1230	< 0.5 mg/L	11/02/2004 1416	CVS	EPA 8015B

CCW CHANNEL

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
11/01/2004 1225	< 0.5 mg/L	11/02/2004 1339	CVS	EPA 8015B

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 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	04	11	01	To	04	11	30

MAJOR
(SUBR 01)
F - FINAL
BIOMONITORING FOR OUTFALL 101
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			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100	********	********	23	0	1 / 0	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MINIMUM	********	********	PERCENT		QTRLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100	********	********	23	0	1 / 0	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MIMINUM	********	********	PERCENT		QTRLY	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
J. Randy Douet Site Vice President			423	843-6700	04	12	10
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled November 7-12, 2004. Report is attached.

December 8, 2004

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, OUTFALL 101, NOVEMBER, 2004

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 November 7-12, 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, R&TA, CTR 1B-M

SQN November 2004M

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: December 8, 2004

1. Facility / Discharger: Sequoyah Nuclear Plant/TVA
2. County / State: Hamilton/Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 1531.8
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 3491.1
8. Outfall Tested: 101
9. Dates Sampled: November 7-12, 2004
10. Average Flow on Days Sampled (MGD): 860, 870, 873, 874, 868, 877
11. Pertinent Site Conditions: H-130M was injected from November 9-12, 2004. The dates and times for the H-130M injection are in the following table. See Appendix B for complete additional chemical application information during the sample collection period.

Injection Location	Date/Start Time (ET)	Date/Ending Time (ET)
Essential Raw Cooling Water (ERCW) Train A	11/09/2004 1000	11/12/2004 1800

12. Test Dates: November 9-16, 2004
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)

15. Concentrations Tested (%): Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0
Intake: 100.0

Pimephales promelas: UV treated Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0
UV treated Intake: 100.0

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: Stephanie Howard Phone #: (423) 843-6700

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 November 7-12, 2004, 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 (ET) Collected	Date (MM/DD/YY)/ Time (ET) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (ET) Used By
101	11/07/04 0830 to 11/08/04 0730	11/08/04 1350	2.4†	<0.10	11/09/04 1340 11/10/04 1307
Intake	11/07/04 0801 to 11/08/04 0701	11/08/04 1350	3.5	<0.10	11/09/04 1340 11/10/04 1307
101	11/09/04 0846 to 11/10/04 0746	11/10/04 1337	1.4†	<0.10	11/11/04 1252 11/12/04 1400
Intake	11/09/04 0816 to 11/10/04 0716	11/10/04 1337	1.1	<0.10	11/11/04 1252 11/12/04 1400
101	11/11/04 0757 to 11/12/04 0657	11/12/04 1225	2.1† 1.4	<0.10	11/13/04 1332 11/14/04 1326 11/15/04 1350
Intake	11/11/04 0729 to 11/12/04 0629	11/12/04 1225	1.0	<0.10	11/13/04 1332 11/14/04 1326 11/15/04 1350

*TRC = Total Residual Chlorine
†Samples were collected in two 2.5 gallon cubitianers. Temperature was measured in each cubitianers upon arrival.

4. Sample Manipulation: Samples 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:	22.0-23.5 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 Water	Moderately Hard Synthetic Water
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	11/09/04 - 1322 ET	11/09/04 - 1340 ET
UV Treated Outfall 101	11/09/04 - 1310 ET	
7. Test Termination: (Date/Time)		
Outfall 101	11/16/04 - 1300 ET	11/16/04 - 1253 ET
UV Treated Outfall 101	11/16/04 - 1318 ET	
8. Test Temperature: Outfall 101:	Mean = 24.7°C (24.2 - 25.4°C)	Mean = 25.0°C (24.5 - 25.3°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.9°C (24.2 - 25.4°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 November 9-16, 2004 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100.0%	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	0.571	0.556	0.618	0.546	0.573
10.98%	0.661	0.669	0.694	0.599	0.656
22.0%	0.658	0.520	0.533	0.600	0.578
43.9%	0.696	0.655	0.658	0.623	0.658
72.0%	0.626	0.635	0.607	0.525	0.598
100.0%	0.600	0.558	0.582	0.638	0.595
Intake	0.629	0.644	0.662	0.606	0.635

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 November 9-16, 2004 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100.0%	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	28	27	33	27	29	30	29	31	31	31	29.6
10.98%	34	31	33	34	32	31	28	27	29	31	31.0
22.0%	34	32	33	33	33	36	27	29	33	29	31.9
43.9%	32	31	34	34	32	34	35	31	30	32	32.5
72.0%	38	33	37	33	33	35	37	32	34	35	34.7
100.0%	30	34	35	31	36	33	30	35	31	36	33.1

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 November 9-16, 2004 using water 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	29	34	27	29	28	29	29	26	32	30	29.3
Intake	28	29	29	28	25	27	27	28	28	31	28.0

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

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

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 November 9-16, 2004 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	98	98	98
10.98%	100	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100.0%	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	0.613	0.686	0.677	0.569	0.636
10.98%	0.685	0.617	0.597	0.679	0.645
22.0%	0.604	0.679	0.649	0.652	0.646
43.9%	0.516	0.514	0.666	0.668	0.591
72.0%	0.592	0.639	0.666	0.715	0.653
100.0%	0.715	0.611	0.560	0.754	0.660
Intake	0.637	0.694	0.734	0.661	0.682

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

*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	November 9-16, 2004	1238	7-days	KCl	0.54 g/L
Ceriodaphnia dubia	November 2-9, 2004	1230	7-days	NaCl	1.06 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, November 9 -16, 2004.

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	24.9 24.7 - 25.3	24.6 24.3 - 24.9	7.9 7.8 - 8.0	7.5 6.9 - 8.0	8.05 7.98 - 8.12	7.86 7.72 - 7.96	298 293 - 306	62 61 - 63	85 83 - 89	- - -
	10.98%	24.9 24.7 - 25.3	24.5 24.3 - 24.8	7.9 7.8 - 8.0	7.5 6.9 - 7.9	8.08 7.99 - 8.15	7.83 7.65 - 7.94	285 280 - 290	- - -	- - -	- - -
	22%	24.9 24.8 - 25.1	24.5 24.2 - 24.7	8.0 7.7 - 8.2	7.5 6.8 - 8.0	8.08 8.02 - 8.13	7.82 7.66 - 7.94	270 262 - 283	- - -	- - -	- - -
	43.9%	24.9 24.6 - 25.2	24.4 24.2 - 24.7	8.0 7.7 - 8.2	7.4 6.8 - 8.0	8.05 8.01 - 8.09	7.80 7.66 - 7.93	233 225 - 238	- - -	- - -	- - -
	72%	24.9 24.5 - 25.3	24.5 24.2 - 24.7	8.0 7.7 - 8.2	7.4 6.9 - 8.0	8.01 7.97 - 8.04	7.78 7.64 - 7.91	189 181 - 194	- - -	- - -	- - -
	100%	24.9 24.4 - 25.4	24.5 24.3 - 24.9	7.9 7.7 - 8.2	7.4 7.0 - 7.9	7.96 7.92 - 8.01	7.76 7.62 - 7.86	145 139 - 150	52 51 - 53	57 54 - 59	<0.10 <0.10 - <0.10
	Intake	25.0 24.7 - 25.3	24.5 24.3 - 24.7	7.9 7.8 - 8.2	7.5 7.1 - 8.0	7.99 7.93 - 8.03	7.76 7.62 - 7.86	142 135 - 146	51 50 - 51	57 54 - 59	<0.10 <0.10 - <0.10
Ceriodaphnia dubia	Control	25.0 24.7 - 25.2	25.0 24.8 - 25.2	7.9 7.8 - 8.0	7.9 7.8 - 8.1	8.05 7.98 - 8.12	8.00 7.89 - 8.08	298 293 - 306	62 61 - 63	85 83 - 89	- - -
	10.98%	24.9 24.7 - 25.3	25.0 24.7 - 25.3	7.9 7.8 - 8.0	7.9 7.7 - 8.2	8.08 7.99 - 8.15	8.01 7.94 - 8.07	285 280 - 290	- - -	- - -	- - -
	22%	24.9 24.7 - 25.1	24.9 24.7 - 25.1	8.0 7.7 - 8.2	7.9 7.7 - 8.2	8.08 8.02 - 8.13	8.01 7.95 - 8.07	270 262 - 283	- - -	- - -	- - -
	43.9%	24.9 24.8 - 25.3	24.9 24.7 - 25.1	8.0 7.7 - 8.2	7.9 7.8 - 8.2	8.05 8.01 - 8.09	8.01 7.94 - 8.06	233 225 - 238	- - -	- - -	- - -
	72%	24.9 24.6 - 25.3	25.0 24.8 - 25.3	8.0 7.7 - 8.2	8.0 7.8 - 8.2	8.01 7.97 - 8.04	7.99 7.91 - 8.05	189 181 - 194	- - -	- - -	- - -
	100%	25.0 24.5 - 25.2	25.0 24.7 - 25.3	7.9 7.7 - 8.2	7.9 7.7 - 8.2	7.96 7.92 - 8.01	7.96 7.88 - 8.03	145 139 - 150	52 51 - 53	57 54 - 59	<0.10 <0.10 - <0.10
	Intake	24.9 24.5 - 25.2	25.0 24.7 - 25.2	7.9 7.8 - 8.2	7.9 7.7 - 8.1	7.99 7.93 - 8.03	7.93 7.86 - 8.01	142 135 - 146	51 50 - 51	57 54 - 59	<0.10 <0.10 - <0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.7	24.2	25.4
Ceriodaphnia dubia	25.0	24.5	25.3

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV-Treated Outfall 101, November 9-16, 2004.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)
Pimephales promelas	Control	24.9 24.8 - 25.3	24.7 24.3 - 25.1	7.9 7.8 - 8.1	7.5 6.9 - 8.1	8.09 8.04 - 8.15	7.82 7.66 - 7.95	302 285 - 310
	10.98%	25.0 24.7 - 25.3	24.7 24.3 - 25.0	7.9 7.7 - 8.2	7.5 7.0 - 8.1	8.08 8.01 - 8.12	7.80 7.66 - 7.96	284 269 - 295
	22%	25.0 24.7 - 25.4	24.6 24.2 - 24.9	7.9 7.7 - 8.2	7.5 6.9 - 8.2	8.07 7.99 - 8.12	7.80 7.64 - 7.96	270 262 - 284
	43.9%	25.0 24.8 - 25.3	24.7 24.3 - 24.9	7.9 7.7 - 8.2	7.5 6.9 - 8.2	8.05 7.98 - 8.12	7.78 7.63 - 7.94	237 233 - 240
	72%	25.1 24.8 - 25.4	24.6 24.2 - 24.9	7.8 7.5 - 8.2	7.4 6.8 - 8.2	8.01 7.94 - 8.05	7.75 7.59 - 7.92	192 187 - 194
	100%	25.1 24.7 - 25.4	24.8 24.4 - 24.9	7.8 7.6 - 8.2	7.4 7.1 - 8.1	7.97 7.90 - 8.02	7.76 7.64 - 7.88	146 139 - 152
	Intake	25.0 24.9 - 25.2	24.7 24.2 - 24.9	7.9 7.7 - 8.2	7.3 7.0 - 8.1	7.99 7.92 - 8.08	7.73 7.57 - 7.89	145 141 - 149

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.9	24.2	25.4

SUMMARY / CONCLUSIONS

Outfall 101 samples collected November 7-12, 2004, 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 by EPA Method 170.1.

4. Dissolved oxygen was measured by EPA Method 360.1.

5. The pH was measured by EPA Method 150.1.

6. Conductance was measured by EPA Method 120.1.

7. Alkalinity was measured by EPA Method 310.1.

8. Total Hardness was measured by EPA Method 130.2.

9. Total residual chlorine was measured by 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 mg/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. TN0026450.

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).

4. Quality Assurance Program: Standard Operating Procedures, Environmental Testing Solutions, Inc (most current version).

Sequoyah Nuclear Plant Biomonitoring
November 7-12, 2004

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 Mollusks, During Toxicity Test Sampling,
March 12, 1998 - November 12, 2004

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 Mollusks, During Toxicity Test Sampling, March 12, 1998 - November 12, 2004

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	0.061	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 Mollusks, During Toxicity Test Sampling, March 12, 1998 - November 12, 2004

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 Mollusks, During Toxicity Test Sampling, March 12, 1998 - November 12, 2004

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	-	-
10/05/2003	-	<0.0043	0.057	0.020	-	-	-
10/06/2003	-	<0.0043	0.057	0.020	-	-	0.025
10/07/2003	-	<0.0090	0.057	0.020	-	-	0.025
10/08/2003	-	<0.0106	0.057	0.020	-	-	0.025
10/09/2003	-	0.0181	0.026	0.022	-	-	0.025
10/10/2003	-	0.0183	0.026	0.024	0.009	-	-
02/01/2004	-	0.0093	0.027	0.009	-	-	-
02/02/2004	-	<0.0034	0.026	0.009	-	-	-
02/03/2004	-	<0.0034	0.026	0.009	-	-	-
02/04/2004	-	0.0124	0.026	0.009	0.009	-	-
02/05/2004	-	<0.0034	0.026	0.009	-	-	-
02/06/2004	-	0.0105	0.026	0.009	0.010	-	-
05/04/2004	-	<0.0123	0.026	0.019	-	-	0.025
05/05/2004	-	<0.0144	0.026	0.014	0.009	-	0.025
05/06/2004	-	<0.0146	0.037	0.013	-	-	0.025
05/07/2004	-	0.0227	0.058	0.020	0.009	-	0.025
05/08/2004	-	0.016	0.060	0.021	-	-	-
05/09/2004	-	<0.0104	0.058	0.020	-	-	-
07/04/2004	-	0.0217	0.057	0.019	-	-	-
07/05/2004	-	<0.0085	0.057	0.020	0.009	-	-
07/06/2004	-	<0.0077	0.058	0.020	-	-	0.031
07/07/2004	-	0.0252	0.056	0.019	-	-	0.031
07/08/2004	-	0.0223	0.057	0.019	0.009	-	-
07/09/2004	-	0.0182	0.057	0.020	0.009	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 - November 12, 2004

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
11/07/2004	-	<0.0187	0.000	0.014	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041
11/10/2004	-	<0.0149	0.047	0.016	-	-	0.041
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043
11/12/2004	-	<0.0253	0.048	0.017	-	-	0.042
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	
	-				-	-	

Sequoyah Nuclear Plant Biomonitoring
November 9-16, 2004

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

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

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 1557 Laboratory Use				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By:	Time	Appearance
SQN-101-TOX	Comp	11/7/04 –11/8/04	0830/0730	2 (2.5gal)	NA			✓		041108.01	2.4°C	JS	1350	* see
SQN-INT-TOX	Comp	11/7/04 –11/8/04	0801/0701	1 (2.5 gal)	NA			✓		041108.02	3.5°C	JS	1350	COMMENTS

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	11/8/2004 0938	Express Courier Lo Ro Henry Jr	11/8/2004 0940
Express Courier Lo Ro Henry Jr	11/8/2004 1350	ETS Jim Jumner	11/8/2004 1350

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:

* Custody seals intact. Samples received in good condition. J/Jumer

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project 1557 Laboratory Use				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	11/9/04-11/10/04	0846/0746	2 (2.5gal)	NA			✓		041110.07	1.4 °C	J	1337	* See
SQN-INT-TOX	Comp	11/9/04 -11/10/04	0816/0716	1 (2.5 gal)	NA			✓		041110.08	1.1 °C	J	1337	COMMENTS

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	11/10/2004 0848	Express Courier L. R. Hemphill	11/10/2004 0848
Express Courier L. R. Hemphill	11/10/2004 1337 ~~0848~~	ETS Jim Jumer	11/10/2004 1337

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen

Environmental Testing Solution, Inc.
351 Depot Street
Ashville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

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

General Comments:
SAMPLE HAVE SEDIMENT AT THE BOTTOM DUE TO RAIN AND DIFFUSER POND LEVEL DROPPING
ANN HURT 11/12/2004

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Proj wt# 1557 Laboratory Use				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	11/11/04 - 11/12/04	0757/0657	2 (2.5gal)	NA	✓				041112.01	2.1°C/1.4°C	JS	1225	*see
SQN-INT-TOX	Comp	11/11/04 – 11/12/04	0729/0629	1 (2.5 gal)	NA	✓				041112.02	1.0°C	JS	1225	comments

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	11/12/2004 0830	Express Courier L. A. Stringfellow	11/12/2004 0830
Express Courier L. A. Stringfellow	11/12/2004 1225	ETS Jim Jumper	11/12/2004 1225

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 6°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

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

Client: TVA
Facility: Sequoyah Nuclear Plant - Non-treated
NPDES #: TN 0026450
Project #: 1557

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	22 TO 23.5 HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	11-08-04 1400 TO 1530	Incubator number:	3D
Organism source:	ABS BATCH 11-08-04	*Artemia* lot number:	BG10055
Transfer bowl information:	pH = 7.98 Temperature = 24.0 °C	Total drying time:	24 HOURS
		Date / Time in: 11-16-04	1320
Average transfer volume:	9.5 ml	Date / Time out: 11-17-04	1330
		Oven temperature:	61°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	11-09-04	—IC	1400	~~1310~~ 1322	11-05-04	041108.01 / .02	JI
1	11-10-04	0850	1502	1241	11-07-04	041108.01 / .02	JI
2	11-11-04	0900	1505	1230	11-09-04	041110.07 / .08	JI
3	11-12-04	0913	1522	~~1230~~ 1336	11-09-04	041110.07 / .08	JI
4	11-13-04	0900	1500	1233	11-09-04	041112.01 / .02	JI / KEK
5	11-14-04	0847	1506	1240	11-12-04	041112.01 / .02	KEK
6	11-15-04	0850	1500	1234	11-12-04	041112.01 / .02	KEK
7	11-16-04			1300			KEK

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.573		NOEC	100%
Average weight per surviving larvae:	0.573	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* **Date:** 11-09-04

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	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	~~9~~ 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	1SM 10	1SM 10	10
A = Pan weight (mg) Tray color code:: BROWN Analyst: CAJ BEAKER	15.01	14.64	15.04	14.38	14.28	14.96	14.32	15.18	14.91	14.78	14.80	14.44
B = Pan + Larvae weight (mg) Analyst: CAJ	20.72	20.20	21.22	19.84	20.89	21.65	21.26	21.17	21.49	19.98	20.13	20.44
Larvae weight (mg) = A – B	5.71	5.56	6.18	5.46	6.61	6.69	6.94	5.99	6.58	5.20	5.33	6.00
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.571	0.556	0.618	0.546	0.661	0.669	0.694	0.599	0.658	0.520	0.533	0.600
Average weight per initial number of larvae (mg)	0.573				0.656				0.578			
Percent reduction from control (%)					-14.5%				-0.9%			

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated **Date:** 11-09-04

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 ISM	10	10	10	10
A = Pan weight (mg) Tray color code:: BROWN Analyst: CAJ BEAKER	14.37	14.36	14.90	14.88	14.59	14.90	15.03	15.32	14.85	14.82	15.10	14.95
B = Pan + Larvae weight (mg) Analyst: CAJ	21.33	20.91	21.48	21.11	20.85	21.25	21.10	20.57	20.85	20.40	20.92	21.33
Larvae weight (mg) = A – B	6.96	6.55	6.58	6.23	6.26	6.35	6.07	5.25	6.00	5.58	5.82	6.38
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.696	0.655	0.658	0.623	0.626	0.635	0.607	0.525	0.600	0.558	0.582	0.638
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.658		-14.9%		0.598		-4.5%		0.595		-3.8%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated **Date:** 11-09-04

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) Tray color code:: BROWN Analyst: CAJ BEAKER	14.98	15.06	14.72	14.87
B = Pan + Larvae weight (mg) Analyst: CAJ	21.27	21.50	21.34	20.93
Larvae weight (mg) = A – B	6.29	6.44	6.62	6.06
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.629	0.644	0.662	0.606
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.635		-10.9%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: JH

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

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, Outfall 101 - Non-treated
Test dates: November 9-16, 2004
Project number: 1557

Reviewed by: Yuma

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 / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	15.01	20.72	5.71	0.571	0.573	5.6	0.571	100.0	0.573	5.6	Not applicable
	B	10	10	14.64	20.20	5.56	0.556			0.556				
	C	10	10	15.04	21.22	6.18	0.618			0.618				
	D	10	10	14.38	19.84	5.46	0.546			0.546				
10.98%	E	10	10	14.28	20.89	6.61	0.661	0.656	6.2	0.661	100.0	0.656	6.2	-14.5
	F	10	10	14.96	21.65	6.69	0.669			0.669				
	G	10	10	14.32	21.26	6.94	0.694			0.694				
	H	10	10	15.18	21.17	5.99	0.599			0.599				
22%	I	10	10	14.91	21.49	6.58	0.658	0.578	11.1	0.658	100.0	0.578	11.1	-0.9
	J	10	10	14.78	19.98	5.20	0.520			0.520				
	K	10	10	14.80	20.13	5.33	0.533			0.533				
	L	10	10	14.44	20.44	6.00	0.600			0.600				
43.9%	M	10	10	14.37	21.33	6.96	0.696	0.658	4.5	0.696	100.0	0.658	4.5	-14.9
	N	10	10	14.36	20.91	6.55	0.655			0.655				
	O	10	10	14.90	21.48	6.58	0.658			0.658				
	P	10	10	14.88	21.11	6.23	0.623			0.623				
72%	Q	10	10	14.59	20.85	6.26	0.626	0.598	8.4	0.626	100.0	0.598	8.4	-4.5
	R	10	10	14.90	21.25	6.35	0.635			0.635				
	S	10	10	15.03	21.10	6.07	0.607			0.607				
	T	10	10	15.32	20.57	5.25	0.525			0.525				
100%	U	10	10	14.85	20.85	6.00	0.600	0.595	5.7	0.600	100.0	0.595	5.7	-3.8
	V	10	10	14.82	20.40	5.58	0.558			0.558				
	W	10	10	15.10	20.92	5.82	0.582			0.582				
	X	10	10	14.95	21.33	6.38	0.638			0.638				
100% Intake	Y	10	10	14.98	21.27	6.29	0.629	0.635	3.7	0.629	100.0	0.635	3.7	-10.9
	Z	10	10	15.06	21.50	6.44	0.644			0.644				
	AA	10	10	14.72	21.34	6.62	0.662			0.662				
	BB	10	10	14.87	20.93	6.06	0.606			0.606				

Outfall 101:
Dunnett's MSD value: 0.0739
PMSD: 12.9

Intake:
Dunnett's MSD value: 0.0386
PMSD: 6.7

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.6% 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.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/9/2004	Test ID:	PpPRCR	Sample ID:	TVA / SQN 101 - Non-treated
End Date:	11/16/2004	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.5710	0.5560	0.6180	0.5460
10.98	0.6610	0.6690	0.6940	0.5990
22	0.6580	0.5200	0.5330	0.6000
43.9	0.6960	0.6550	0.6580	0.6230
72	0.6260	0.6350	0.6070	0.5250
100	0.6000	0.5580	0.5820	0.6380

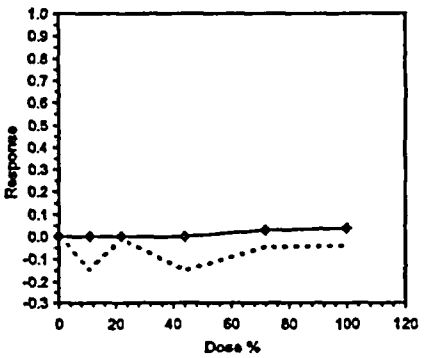
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5728	1.0000	0.5728	0.5460	0.6180	5.564	4				0.6161	1.0000
10.98	0.6558	1.1449	0.6558	0.5990	0.6940	6.155	4	-2.706	2.410	0.0739	0.6161	1.0000
22	0.5778	1.0087	0.5778	0.5200	0.6580	11.071	4	-0.163	2.410	0.0739	0.6161	1.0000
43.9	0.6580	1.1488	0.6580	0.6230	0.6960	4.541	4	-2.780	2.410	0.0739	0.6161	1.0000
72	0.5983	1.0445	0.5983	0.5250	0.6350	8.393	4	-0.831	2.410	0.0739	0.5983	0.9711
100	0.5945	1.0380	0.5945	0.5580	0.6380	5.672	4	-0.709	2.410	0.0739	0.5945	0.9650

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.980021954	0.884	-0.07339446	-0.45529025
Bartlett's Test indicates equal variances (p = 0.78)	2.494269133	15.08627224		

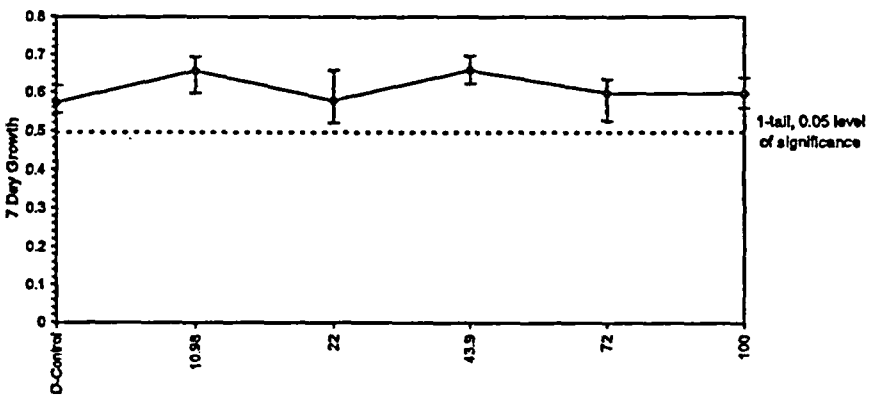
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.073908852	0.129042082	0.0057612	0.001881	0.035764091	5, 18
Treatments vs D-Control										

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_11-09-04data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/9/2004	Test ID:	PpFRCR	Sample ID:	TVA / SQN 101 Intake - Non-treated
End Date:	11/16/2004	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

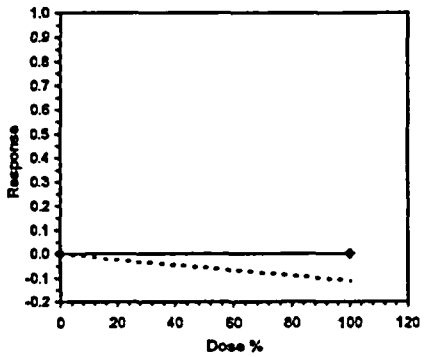
Conc-%	1	2	3	4
D-Control	0.5710	0.5560	0.6180	0.5460
100	0.6290	0.6440	0.6620	0.6060

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5728	1.0000	0.5728	0.5460	0.6180	5.564	4				0.6040	1.0000
100	0.6353	1.1091	0.6353	0.6060	0.6620	3.733	4	-3.147	1.943	0.0386	0.6040	1.0000

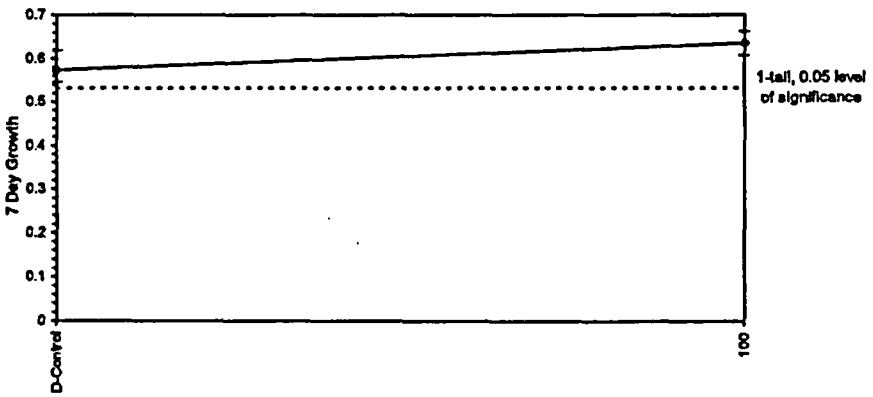
Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.940208614		0.749		0.686194278	-0.37521312
F-Test indicates equal variances (p = 0.64)	1.806284308		47.46722794			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates no significant differences	0.038593456	0.067382726	0.0078125	0.000788917	0.019893471	1, 6
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_11-09-04data

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

Client: TVA
Facility: Sequoyah Nuclear Plant - Non-treated
NPDES #: TN 0026450
Project #: 1557

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	< 24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	11-09-04 0811 TO 1043	Incubator number and shelf location:	2C1
Organism source:	11-02-04 A-F	YCT batch:	10-05-04
Transfer bowl information:	pH = 8.06 Temperature = 25.1	*Selenastrum* batch:	10-26-04

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHS	Sample numbers used	Analyst
0	11-09-04	1340	11-05-04	041108.01 / .02	dl
1	11.10.04	1307	11-07-04	041108.01 / .02	dl
2	11.11.04	1252	11-09-04	041110.07 / .08	dl
3	11.12.04	1400	11-09-04	041110.07 / .08	dl
4	11.13.04	1332	11-09-04	041112.01 / .02	dl
5	11.14.04	1326	11-12-04	041112.01 / .02	dl
6	11.15.04	1350	11-12-04	041112.01 / .02	dl
7	11.16.04	1253			dl

Control information:	Control # 1	2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	29.6	29.3	≥ 15.0 offspring/female	ChV	>100%
% CV:	6.6%	7.9%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated **Date:** 11-09-04

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	4	5	4	5	6	5	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	*4	0	0	9	0	11	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	9	8	*6	9	10	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	18	14	14	15	14	15	17	16
Total young produced		28	27	33	27	29	30 ~~29~~	29	31	31	31
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

*SPLIT BROOD

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.6

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	5	4	5	6	5	5	4	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	9	12	12	10	9	9	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	11	9	0	0	0	0	0	0	0	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	18	19	16	15	16	15	14	14	17
Total young produced		34	31	~~32~~ 33	34	32	31	28	27	29	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.0
% Reduction from Control:	-4.7%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 11-09-04

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	5	5	4	5	5	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	0	11	10	0	13	9	9	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	9	0	0	11	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	18	17	19	17	18	14	15	17	14
Total young produced		34	32	33	33	33	36	27	29	33	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.9
% Reduction from Control:	-7.8%

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	5	4	4	5	6	5	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	11	11	10	0	9	11	10	0	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	10	0	0	0	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	16	19	19	16	20	19	16	15	16
Total young produced		32	31	34	34	32	34	35	31	30	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.5
% Reduction from Control:	-9.8%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 11-09-04

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	5	6	4	5	5	5	6	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	12	10	11	9	11	11	10	10	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	20	16	21	18	19	19	21	16	20	17
Total young produced		38	33	37	33	33	35	37	32	34	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.7
% Reduction from Control:	-17.2%

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	6	4	5	5	6	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	0	0	0	0	12	10	10	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	11	11	9	12	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	18	18	16	20	16	15	19	16	19
Total young produced		30	34	35	31	36	33	30	35	31	36
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.1
% Reduction from Control:	-11.8%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 11-09-04

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	5	3	4	3	4	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	9	10	10	9	9	11	11	9	10	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	19	14	16	16	14	14	13	18	17
Total young produced		29	34	27	29	28	29	29	26	32	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.3
% Reduction from Control:	—

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	4	3	4	4	5	4	3	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	12	10	10	9	9	10	10	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	13	16	14	12	13	13	15	13	16
Total young produced		28	29	29	28	25	27	27	28	28	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.0
% Reduction from Control:	4.47%

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

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	4	4	5	4	5	6	5	5	4	5	47
5	0	0	4	0	0	9	0	11	10	10	44
6	9	8	6	9	10	0	10	0	0	0	52
7	15	15	18	14	14	15	14	15	17	16	153
Total	28	27	33	27	29	30	29	31	31	31	296

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	5	6	4	5	5	5	6	4	5	50
5	13	12	10	11	9	11	11	10	10	13	110
6	0	0	0	0	0	0	0	0	0	0	0
7	20	16	21	18	19	19	21	16	20	17	187
Total	38	33	37	33	33	35	37	32	34	35	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	5	4	5	6	5	5	4	4	5	5	48
5	0	0	9	12	12	10	9	9	10	0	71
6	11	9	0	0	0	0	0	0	0	9	29
7	18	18	19	16	15	16	15	14	14	17	162
Total	34	31	33	34	32	31	28	27	29	31	310

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	6	4	5	5	6	5	5	52
5	9	0	0	0	0	12	10	10	10	12	63
6	0	11	11	9	12	0	0	0	0	0	43
7	16	18	18	16	20	16	15	19	16	19	173
Total	30	34	35	31	36	33	30	35	31	36	331

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	5	5	4	5	5	4	5	5	5	49
5	12	0	11	10	0	13	9	9	11	10	85
6	0	9	0	0	11	0	0	0	0	0	20
7	16	18	17	19	17	18	14	15	17	14	165
Total	34	32	33	33	33	36	27	29	33	29	319

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	5	3	4	3	4	4	4	4	4	39
5	0	0	0	0	0	0	0	0	0	9	9
6	9	10	10	9	9	11	11	9	10	0	88
7	16	19	14	16	16	14	14	13	18	17	157
Total	29	34	27	29	28	29	29	26	32	30	293

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	5	4	4	5	6	5	5	5	5	5	49
5	11	11	11	10	0	9	11	10	0	11	84
6	0	0	0	0	10	0	0	0	10	0	20
7	16	16	19	19	16	20	19	16	15	16	172
Total	32	31	34	34	32	34	35	31	30	32	325

100% Intake

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	4	5	4	3	5	5	41
5	0	0	0	0	0	0	0	0	0	0	0
6	10	12	10	10	9	9	10	10	10	10	100
7	14	13	16	14	12	13	13	15	13	16	139
Total	28	29	29	28	25	27	27	28	28	31	280

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

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

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

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated

Test dates: November 9-16, 2004

Project number: 1557

Reviewed 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	28	27	33	27	29	30	29	31	31	31	100	29.6	6.6	Not applicable
10.98%	34	31	33	34	32	31	28	27	29	31	100	31.0	7.8	-4.7
22%	34	32	33	33	33	36	27	29	33	29	100	31.9	8.5	-7.8
43.9%	32	31	34	34	32	34	35	31	30	32	100	32.5	5.1	-9.8
72%	38	33	37	33	33	35	37	32	34	35	100	34.7	5.9	-17.2
100%	30	34	35	31	36	33	30	35	31	36	100	33.1	7.3	-11.8
Control - 2	29	34	27	29	28	29	29	26	32	30	100	29.3	7.9	Not applicable
100% Intake	28	29	29	28	25	27	27	28	28	31	100	28.0	5.6	4.4

Outfall 101:
Dunnett's MSD value: 2.282
PMSD: 7.7

Intake:
Dunnett's MSD value: 1.530
PMSD: 5.2

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 *Ceriodaphnia* reproduction by 10.0% 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.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/9/2004	Test ID:	CdFRCR	Sample ID:	TVA / SQN 101 - Non-treated
End Date:	11/16/2004	Lab ID:	BTS-Envir. Testing Sol	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	27.000	33.000	27.000	29.000	30.000	29.000	31.000	31.000	31.000
10.98	34.000	31.000	33.000	34.000	32.000	31.000	28.000	27.000	29.000	31.000
22	34.000	32.000	33.000	33.000	33.000	36.000	27.000	29.000	33.000	29.000
43.9	32.000	31.000	34.000	34.000	32.000	34.000	35.000	31.000	30.000	32.000
72	38.000	33.000	37.000	33.000	33.000	35.000	37.000	32.000	34.000	35.000
100	30.000	34.000	35.000	31.000	36.000	33.000	30.000	35.000	31.000	36.000

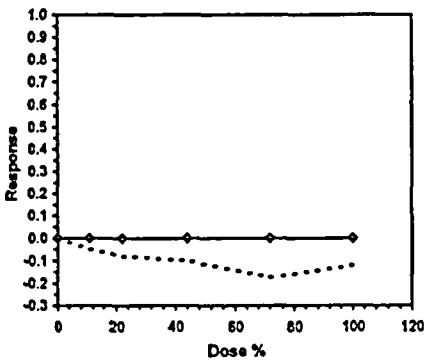
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	29.600	1.0000	29.600	27.000	33.000	6.605	10				32.133	1.0000
10.98	31.000	1.0473	31.000	27.000	34.000	7.754	10	-1.403	2.287	2.282	32.133	1.0000
22	31.900	1.0777	31.900	27.000	36.000	8.547	10	-2.305	2.287	2.282	32.133	1.0000
43.9	32.500	1.0980	32.500	30.000	35.000	5.077	10	-2.906	2.287	2.282	32.133	1.0000
72	34.700	1.1723	34.700	32.000	38.000	5.929	10	-5.111	2.287	2.282	32.133	1.0000
100	33.100	1.1182	33.100	30.000	36.000	7.325	10	-3.508	2.287	2.282	32.133	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.760670602	1.035	-0.17547185	-0.85392101
Bartlett's Test indicates equal variances (p = 0.75)	2.704277992	15.08627224		

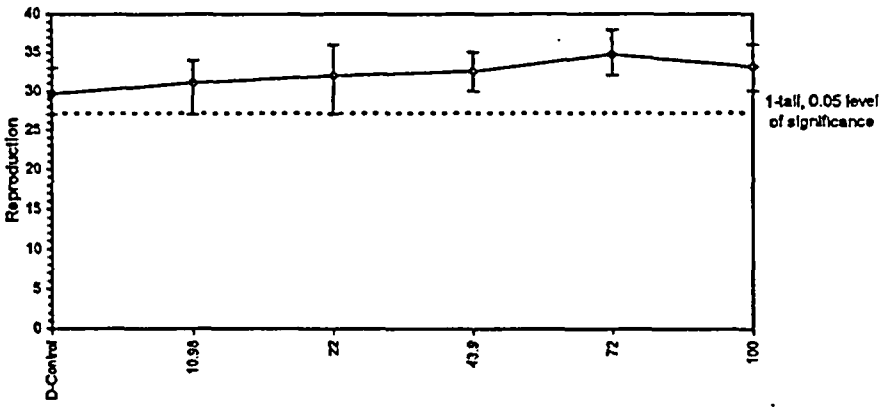
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.281579492	0.077080388	30.82666667	4.977777778	1.3E-04	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_11-09-04data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/9/2004	Test ID:	CdFRCR	Sample ID:	TVA / SQN 101 Intake - Non-treated
End Date:	11/16/2004	Lab ID:	BTS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	29.000	34.000	27.000	29.000	28.000	29.000	29.000	26.000	32.000	30.000
100	28.000	29.000	29.000	28.000	25.000	27.000	27.000	28.000	28.000	31.000

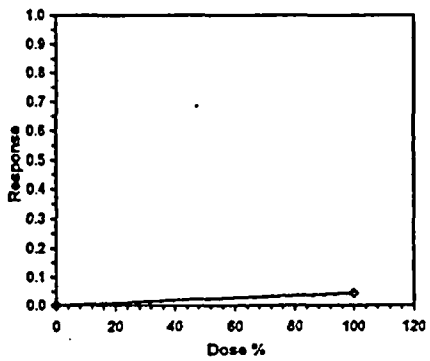
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	29.300	1.0000	29.300	26.000	34.000	7.890	10				29.300	1.0000
100	28.000	0.9556	28.000	25.000	31.000	5.584	10	1.473	1.734	1.530	28.000	0.9556

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.937893212	0.868	0.606024152	1.007873826
F-Test indicates equal variances (p = 0.26)	2.186363697	6.541089535		

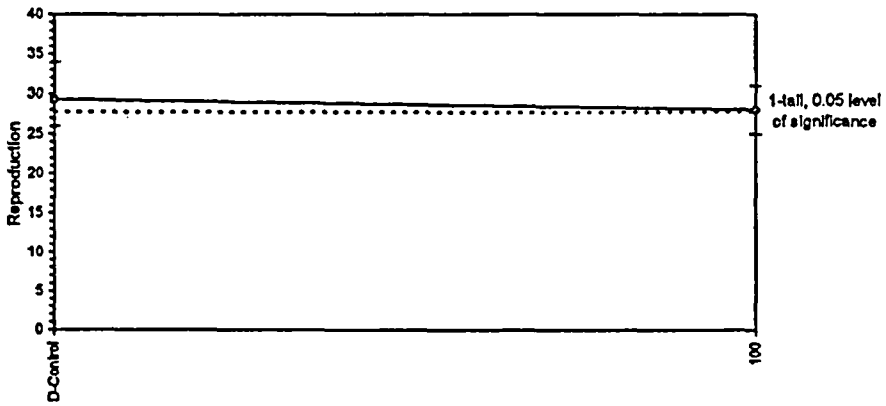
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	1.530392338	0.05223182	8.45	3.894444444	0.158020228	1, 18
Treatments vs D-Control						

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_11-09-04data

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 #: 1557

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	21.75 TO 23.25 HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	11-08-04 1400 TO 1530	Incubator number:	3C
Organism source:	11-08-04 - ABS BATCH	*Artemia* lot number:	BS10055
Transfer bowl information:	pH = 7.98 Temperature = 24.1 °C	Total drying time:	24 HOURS
		Date / Time in: 11-16-04	1320
Average transfer volume:	9.5 mL	Date / Time out: 11-17-04	1330
		Oven temperature:	61°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	11-09-04	—	1400	1310	11-05-04	041108.01 / .02	JJ
1	11-10-04	0850	1502	1220	11-07-04	041108.01 / .02	JJ
2	11-11-04	0900	1505	1214	11-09-04	041110.07 / .08	JJ
3	11-12-04	0913	1522	~~1204~~ 1307	11-09-04	041110.07 / .08	JJ
4	11-13-04	0903	1500	1214	11-09-04	041112.01 / .02	JJ / KEK
5	11-14-04	0847	1506	1227	11-12-04	041112.01 / .02	KEK
6	11-15-04	0850	1500	1214	11-12-04	041112.01 / .02	KEK
7	11-16-04			1318			KEK

Control information:			Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	~~8%~~	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:		0.636		NOEC	100%
Average weight per surviving larvae:		~~0.638~~ 0.652	≥ 0.25 mg/larvae	LOEC	>100%
				ChV	>100%
				IC_{25}	>100%

Species: *Pimephales promelas* **Date:** 11-09-04

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	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	9 d	10	10	10	10	10	10	10	10
6	10	10	10	9	10	10	10	10	10	10	10	10
7	10	10	10	9	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray color code:: BLACK Analyst: CAJ BEAKER	14.72	14.98	14.99	15.05	14.71	15.13	14.60	14.64	15.04	14.96	14.83	14.59
B = Pan + Larvae weight (mg) Analyst: CAJ	20.85	21.84	21.76	20.74	21.56	21.30	20.63	21.43	21.08	21.75	21.32	21.11
Larvae weight (mg) = A – B	6.13	6.86	6.77	5.69	6.85	6.17	5.97	6.79	6.04	6.79	6.49	6.52
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.613	0.686	0.677	0.569	0.685	0.617	0.597	0.679	0.604	0.679	0.649	0.652
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.636		[redacted]		0.645		-1.3%		0.646		-1.5%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 11-09-04

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	1SM 10	1SM 10	10	10	10	10	10	1LG 10	1LG 10	10	10	1LG 10
A = Pan weight (mg) Tray color code:: BLACK Analyst: CAJ BEAKER	14.85	14.72	15.16	14.70	14.66	14.87	14.61	14.91	14.56	14.75	16.05	14.15
B = Pan + Larvae weight (mg) Analyst: CAJ	20.01	19.86	21.82	21.38	20.58	21.26	21.27	22.06	21.71	20.86	21.65	21.69
Larvae weight (mg) = A – B	5.16	5.14	6.66	6.68	5.92	6.39	6.66	7.15	7.15	6.11	5.60	7.54
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.516	0.514	0.666	0.668	0.592	0.639	0.666	0.715	0.715	0.611	0.560	0.754
Average weight per initial number of larvae (mg)	0.591				0.653				0.660			
Percent reduction from control (%)			7.1%				-2.6%				-3.7%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: dl

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated **Date:** 11-09-04

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	1 LG 10	10
A = Pan weight (mg) Tray color code:: BLACK Analyst: CAJ BEAKER	14.49	14.64	14.87	14.39
B = Pan + Larvae weight (mg) Analyst: CAJ	20.86	21.58	22.21	21.00
Larvae weight (mg) = A – B	6.37	6.94	7.34	6.61
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.637	0.694	0.734	0.661
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.682		-7.1%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: dl

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated

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, Outfall 101 - UV treated
Test dates: November 9-16, 2004
Project number: 1557

Reviewed by: [signature]

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 / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.72	20.85	6.13	0.613	0.652	5.4	0.613	97.5	0.636	8.7	Not applicable
	B	10	10	14.98	21.84	6.86	0.686			0.686				
	C	10	10	14.99	21.76	6.77	0.677			0.677				
	D	10	9	15.05	20.74	5.69	0.632			0.569				
10.98%	E	10	10	14.71	21.56	6.85	0.685	0.645	6.8	0.685	100.0	0.645	6.8	-1.3
	F	10	10	15.13	21.30	6.17	0.617			0.617				
	G	10	10	14.66	20.63	5.97	0.597			0.597				
	H	10	10	14.64	21.43	6.79	0.679			0.679				
22%	I	10	10	15.04	21.08	6.04	0.604	0.646	4.8	0.604	100.0	0.646	4.8	-1.5
	J	10	10	14.96	21.75	6.79	0.679			0.679				
	K	10	10	14.83	21.32	6.49	0.649			0.649				
	L	10	10	14.59	21.11	6.52	0.652			0.652				
43.9%	M	10	10	14.85	20.01	5.16	0.516	0.591	14.9	0.516	100.0	0.591	14.9	7.1
	N	10	10	14.72	19.86	5.14	0.514			0.514				
	O	10	10	15.16	21.82	6.66	0.666			0.666				
	P	10	10	14.70	21.38	6.68	0.668			0.668				
72%	Q	10	10	14.66	20.58	5.92	0.592	0.653	7.9	0.592	100.0	0.653	7.9	-2.6
	R	10	10	14.87	21.26	6.39	0.639			0.639				
	S	10	10	14.61	21.27	6.66	0.666			0.666				
	T	10	10	14.91	22.06	7.15	0.715			0.715				
100%	U	10	10	14.56	21.71	7.15	0.715	0.660	13.6	0.715	100.0	0.660	13.6	-3.7
	V	10	10	14.75	20.86	6.11	0.611			0.611				
	W	10	10	16.05	21.65	5.60	0.560			0.560				
	X	10	10	14.15	21.69	7.54	0.754			0.754				
100% Intake	Y	10	10	14.49	20.86	6.37	0.637	0.682	6.2	0.637	100.0	0.682	6.2	-7.1
	Z	10	10	14.64	21.58	6.94	0.694			0.694				
	AA	10	10	14.87	22.21	7.34	0.734			0.734				
	BB	10	10	14.39	21.00	6.61	0.661			0.661				

Outfall 101:
Dunnett's MSD value: 0.1087
PMSD: 17.1

Intake:
Dunnett's MSD value: 0.0676
PMSD: 10.6

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 15.6% 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.

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/9/2004	Test ID:	PpFRCR	Sample ID:	TVA / SQN 101 - UV-treated
End Date:	11/16/2004	Lab ID:	BTS-Envir. Testing Sol	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.6130	0.6860	0.6770	0.5690
10.98	0.6850	0.6170	0.5970	0.6790
22	0.6040	0.6790	0.6490	0.6520
43.9	0.5160	0.5140	0.6660	0.6680
72	0.5920	0.6390	0.6660	0.7150
100	0.7150	0.6110	0.5600	0.7540

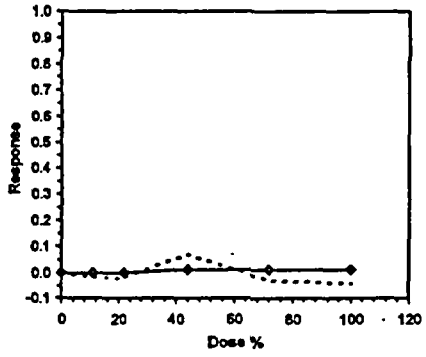
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6363	1.0000	0.6363	0.5690	0.6860	8.703	4				0.6423	1.0000
10.98	0.6445	1.0130	0.6445	0.5970	0.6850	6.848	4	-0.183	2.410	0.1087	0.6423	1.0000
22	0.6460	1.0153	0.6460	0.6040	0.6790	4.811	4	-0.216	2.410	0.1087	0.6423	1.0000
43.9	0.5910	0.9289	0.5910	0.5140	0.6680	14.850	4	1.003	2.410	0.1087	0.6347	0.9882
72	0.6530	1.0263	0.6530	0.5920	0.7150	7.873	4	-0.371	2.410	0.1087	0.6347	0.9882
100	0.6600	1.0373	0.6600	0.5600	0.7540	13.626	4	-0.527	2.410	0.1087	0.6347	0.9882

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.956519902	0.884	-0.07765099	-1.21340363
Bartlett's Test indicates equal variances (p = 0.53)	4.153034687	15.08627224		

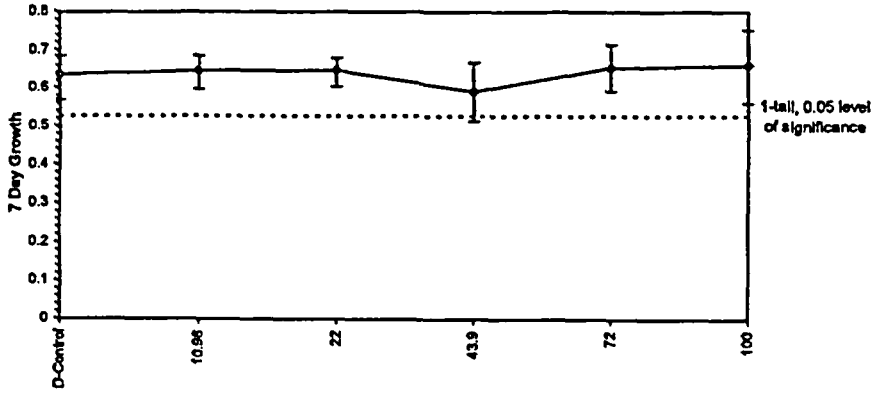
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs D-Control	100	>100		1	0.108702425	0.170848606	0.002420842	0.004068875	0.704186499	5, 18

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_11-09-04data

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/9/2004	Test ID:	PpFRCR	Sample ID:	TVA / SQN 101 Intake - UV-treated
End Date:	11/16/2004	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.6130	0.6860	0.6770	0.5690
100	0.6370	0.6940	0.7340	0.6610

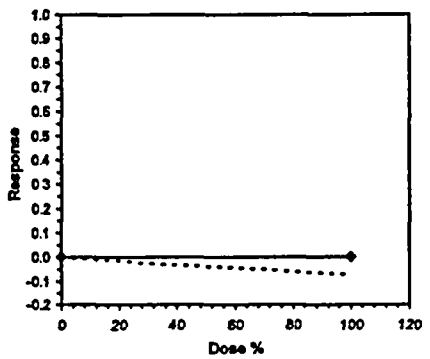
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6363	1.0000	0.6363	0.5690	0.6860	8.703	4				0.6589	1.0000
100	0.6815	1.0711	0.6815	0.6370	0.7340	6.175	4	-1.301	1.943	0.0676	0.6589	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.916089833	0.749	-0.15333942	-1.60140066
F-Test indicates equal variances (p = 0.66)	1.731366515	47.46722794		

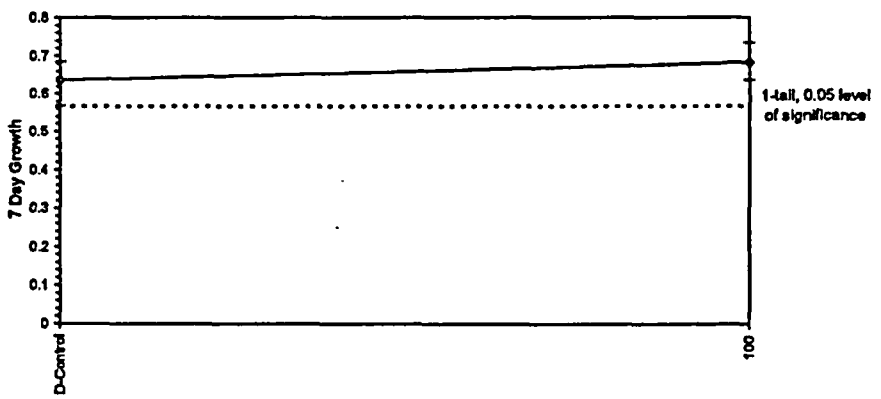
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.067574427	0.106207352	0.004095125	0.002418625	0.240915015	1, 6

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_11-09-04data

Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Non-treated

Test dates: November 09 - 16, 2004

Project number: 1557

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)	8.06	7.96	8.02	7.91	7.98	7.92	8.03	7.73	8.12	7.72	8.05	7.82	8.11	7.96
	DO (mg/L)	7.8	7.8	7.8	7.5	7.9	7.4	7.8	7.0	7.8	6.9	8.0	7.7	7.9	8.0
	Conductivity (µmhos/cm)	299		295		296		306		301		293		293	
	Alkalinity (mg/L $CaCO_3$)	63		61		62						61			
	Hardness (mg/L $CaCO_3$)	89		83		83						83			
	Temperature (°C)	24.8	24.8	24.7	24.6	24.8	24.3	24.9	24.3	24.7	24.6	24.9	24.5	25.3	24.9
10.98%	pH (SU)	8.06	7.93	8.04	7.88	8.07	7.89	8.15	7.65	8.13	7.68	7.99	7.81	8.10	7.94
	DO (mg/L)	7.9	7.8	7.8	7.5	7.9	7.4	8.0	6.9	7.8	7.0	8.0	7.7	8.0	7.9
	Conductivity (µmhos/cm)	285		283		286		287		285		280		290	
	Temperature (°C)	24.7	24.5	24.9	24.5	24.9	24.3	25.1	24.6	24.7	24.6	24.9	24.3	25.3	24.8
22%	pH (SU)	8.06	7.92	8.04	7.86	8.07	7.89	8.13	7.66	8.13	7.68	8.02	7.80	8.11	7.94
	DO (mg/L)	8.0	7.8	7.8	7.4	8.0	7.5	8.0	6.8	7.7	7.0	8.0	7.7	8.2	8.0
	Conductivity (µmhos/cm)	271		263		267		272		271		262		283	
	Temperature (°C)	24.8	24.6	24.8	24.5	24.9	24.2	25.1	24.4	24.9	24.7	24.8	24.5	25.1	24.7
43.9%	pH (SU)	8.03	7.90	8.02	7.81	8.04	7.86	8.09	7.68	8.09	7.66	8.01	7.79	8.07	7.93
	DO (mg/L)	7.9	7.8	7.9	7.3	8.0	7.3	8.0	6.8	7.7	7.0	8.0	7.6	8.2	8.0
	Conductivity (µmhos/cm)	237		228		225		238		237		229		236	
	Temperature (°C)	24.6	24.6	24.9	24.3	25.2	24.2	24.9	24.4	24.9	24.5	24.8	24.4	25.1	24.7
72%	pH (SU)	8.00	7.84	7.98	7.78	7.98	7.87	8.03	7.66	8.04	7.64	7.97	7.78	8.04	7.91
	DO (mg/L)	7.9	7.6	7.9	7.2	8.0	7.3	8.0	6.9	7.7	7.1	8.0	7.5	8.2	8.0
	Conductivity (µmhos/cm)	193		181		191		194		192		182		191	
	Temperature (°C)	24.5	24.7	25.1	24.5	25.3	24.4	25.1	24.2	24.6	24.6	24.6	24.4	25.2	24.7
100%	pH (SU)	7.97	7.81	7.94	7.79	7.92	7.86	7.97	7.62	7.99	7.63	7.93	7.75	8.01	7.85
	DO (mg/L)	7.8	7.6	7.9	7.3	8.1	7.4	7.8	7.0	7.7	7.1	7.9	7.5	8.2	7.9
	Conductivity (µmhos/cm)	150		141		148		149		140		139		146	
	Alkalinity (mg/L $CaCO_3$)	53				51				52					
	Hardness (mg/L $CaCO_3$)	57				59				54					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.4	24.5	25.3	24.4	25.4	24.4	25.3	24.4	24.6	24.5	24.5	24.3	25.0	24.9
100% Intake	pH (SU)	7.98	7.80	7.95	7.81	7.93	7.86	8.03	7.62	8.03	7.62	7.96	7.74	8.02	7.85
	DO (mg/L)	7.8	7.7	8.0	7.5	8.2	7.6	7.8	7.1	7.8	7.3	8.0	7.6	8.0	8.0
	Conductivity (µmhos/cm)	145		142		135		143		146		140		144	
	Alkalinity (mg/L $CaCO_3$)	51				50				51					
	Hardness (mg/L $CaCO_3$)	59				54				59					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.7	24.5	24.9	24.3	25.2	24.4	25.1	24.4	24.8	24.6	24.9	24.3	25.3	24.7

Species: *Pimephales promelas* Date: 11-09-04
Client: TVA / Sequoyah Nuclear Plant – Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.06	7.96	8.02	7.91	7.98	7.92
	DO (mg/L)	7.8	7.8	7.8	7.5	7.9	7.4
	Conductivity (µmhos/cm)	299		295		296	
	Alkalinity (mg $CaCO_3$/L)	63		61		62	
	Hardness (mg $CaCO_3$/L)	89		83		83	
	Temperature (°C)	24.8	24.8	24.7	24.6	24.8	24.3
10.98%	pH (S.U.)	8.06	7.93	8.04	7.88	8.07	7.89
	DO (mg/L)	7.9	7.8	7.8	7.5	7.9	7.4
	Conductivity (µmhos/cm)	285		283		286	
	Temperature (°C)	24.7	24.5	24.9	24.5	24.9	24.3
22%	pH (S.U.)	8.06	7.92	8.04	7.86	8.07	7.89
	DO (mg/L)	8.0	7.8	7.8	7.4	8.0	7.5
	Conductivity (µmhos/cm)	271		263		267	
	Temperature (°C)	24.8	24.6	24.8	24.5	24.9	24.2
43.9%	pH (S.U.)	8.03	7.90	8.02	7.81	8.04	7.86
	DO (mg/L)	7.9	7.8	7.9	7.3	8.0	7.3
	Conductivity (µmhos/cm)	237		228		225	
	Temperature (°C)	24.6	24.6	24.9	24.3	25.2	24.2
72%	pH (S.U.)	8.00	7.84	7.98	7.78	7.98	7.87
	DO (mg/L)	7.9	7.6	7.9	7.2	8.0	7.3
	Conductivity (µmhos/cm)	193		181		191	
	Temperature (°C)	24.5	24.7	25.1	24.5	25.3	24.4
100%	pH (S.U.)	7.97	7.81	7.94	7.79	7.92	7.86
	DO (mg/L)	7.8	7.6	7.9	7.3	8.1	7.4
	Conductivity (µmhos/cm)	150		141		148	
	Alkalinity (mg $CaCO_3$/L)	53				51	
	Hardness (mg $CaCO_3$/L)	57				59	
	TR chlorine (mg/L)	<0.10		K		<0.10	
	Temperature (°C)	24.4	24.5	25.3	24.4	25.4	24.4
100% Intake	pH (S.U.)	7.98	7.80	7.95	7.81	7.93	7.86
	DO (mg/L)	7.8	7.7	8.0	7.5	8.2	7.6
	Conductivity (µmhos/cm)	145		142		135	
	Alkalinity (mg $CaCO_3$/L)	51				50	
	Hardness (mg $CaCO_3$/L)	59				54	
	TR chlorine (mg/L)	<0.10		K		<0.10	
	Temperature (°C)	24.7	24.5	24.9	24.3	25.2	24.4
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 11-09-04
Client: TVA / Sequoyah Nuclear Plant – Non-treated

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.03	7.73	8.12	7.72	8.05	7.82	8.11	7.96
	DO (mg/L)	7.8	7.0	7.8	6.9	8.0	7.7	7.9	8.0
	Conductivity (µmhos/cm)	306		301		293		293	
	Alkalinity (mg $CaCO_3$/L)					61			
	Hardness (mg $CaCO_3$/L)					83			
	Temperature (°C)	24.9	24.3	24.7	24.6	24.9	24.5	25.3	24.9
10.98%	pH (S.U.)	8.15	7.65	8.13	7.68	7.99	7.81	8.10	7.94
	DO (mg/L)	8.0	6.9	7.8	7.0	8.0	7.7	8.0	7.9
	Conductivity (µmhos/cm)	287		285		280		296	
	Temperature (°C)	25.1	24.6	24.7	24.6	24.9	24.3	25.3	24.8
22%	pH (S.U.)	8.13	7.66	8.13	7.68	8.02	7.80	8.11	7.94
	DO (mg/L)	8.0	6.8	7.7	7.0	8.0	7.7	8.2	8.0
	Conductivity (µmhos/cm)	272		271		262		283	
	Temperature (°C)	25.1	24.4	24.9	24.7	24.8	24.5	25.1	24.7
43.9%	pH (S.U.)	8.09	7.68	8.09	7.66	8.01	7.79	8.07	7.93
	DO (mg/L)	8.0	6.8	7.7	7.0	8.0	7.6	8.2	8.0
	Conductivity (µmhos/cm)	238		237		229		236	
	Temperature (°C)	24.9	24.4	24.9	24.5	24.8	24.4	25.1	24.7
72%	pH (S.U.)	8.03	7.66	8.04	7.64	7.97	7.78	8.04	7.91
	DO (mg/L)	8.0	6.9	7.7	7.1	8.0	7.5	8.2	8.0
	Conductivity (µmhos/cm)	194		192		182		191	
	Temperature (°C)	25.1	24.2	24.6	24.6	24.6	24.4	25.2	24.7
100%	pH (S.U.)	7.97	7.62	7.99	7.63	7.93	7.75	8.01	7.85
	DO (mg/L)	7.8	7.0	7.7	7.1	7.9	7.5	8.2	7.9
	Conductivity (µmhos/cm)	149		140		139		146	
	Alkalinity (mg $CaCO_3$/L)			52					
	Hardness (mg $CaCO_3$/L)			54					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.3	24.4	24.6	24.5	24.5	24.3	25.0	24.9
100% Intake	pH (S.U.)	8.03	7.62	8.03	7.62	7.96	7.74	8.02	7.85
	DO (mg/L)	7.8	7.1	7.8	7.3	8.0	7.6	8.0	8.0
	Conductivity (µmhos/cm)	143		146		140		144	
	Alkalinity (mg $CaCO_3$/L)			51					
	Hardness (mg $CaCO_3$/L)			59					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	24.4	24.8	24.6	24.9	24.3	25.3	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Non-treated

Test dates: November 09 - 16, 2004

Project number: 1557

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)	8.06	8.01	8.02	8.08	7.98	8.07	8.03	7.97	8.12	7.89	8.05	8.03	8.11	7.94
	DO (mg/L)	7.8	7.9	7.8	7.8	7.9	7.8	7.8	7.8	7.8	7.9	8.0	8.1	7.9	8.0
	Conductivity (µmhos/cm)	299		295		296		306		301		293		293	
	Alkalinity (mg/L $CaCO_3$)	63		61		62						61			
	Hardness (mg/L $CaCO_3$)	89		83		83						83			
	Temperature (°C)	24.9	24.9	24.9	25.0	24.7	25.2	25.2	25.0	25.2	24.9	25.0	25.1	24.8	24.8
10.98%	pH (SU)	8.06	7.98	8.04	8.07	8.07	8.07	8.15	8.00	8.13	7.94	7.99	8.06	8.10	7.95
	DO (mg/L)	7.9	7.8	7.8	7.8	7.9	7.8	8.0	7.8	7.8	7.7	8.0	8.2	8.0	8.0
	Conductivity (µmhos/cm)	285		283		286		287		285		280		290	
	Temperature (°C)	24.9	25.1	24.9	24.9	24.8	25.3	25.3	24.8	25.0	24.7	25.0	25.3	24.7	24.8
22%	pH (SU)	8.06	7.98	8.04	8.07	8.07	8.07	8.13	8.01	8.13	7.96	8.02	8.06	8.11	7.95
	DO (mg/L)	8.0	7.8	7.9	7.8	8.0	7.9	8.0	7.7	7.7	7.7	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	271		263		267		272		271		262		283	
	Temperature (°C)	24.8	25.1	25.1	24.7	24.7	25.1	25.1	24.9	25.0	24.7	24.9	25.1	24.7	24.8
43.9%	pH (SU)	8.03	7.98	8.02	8.06	8.04	8.06	8.09	8.02	8.09	7.97	8.01	8.06	8.07	7.94
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9	8.0	7.8	7.7	7.8	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	237		228		225		238		237		229		236	
	Temperature (°C)	24.8	25.0	25.0	24.9	24.9	25.1	25.3	24.8	24.9	24.9	24.9	25.1	24.8	24.7
72%	pH (SU)	8.00	7.94	7.98	8.03	7.98	8.04	8.03	8.00	8.04	7.96	7.97	8.05	8.04	7.91
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9	8.0	7.9	7.7	7.8	8.0	8.2	8.2	8.2
	Conductivity (µmhos/cm)	193		181		191		194		192		182		191	
	Temperature (°C)	24.6	25.0	24.9	24.8	24.9	25.2	25.3	25.1	24.9	24.8	25.2	25.3	24.8	24.8
100%	pH (SU)	7.97	7.91	7.94	8.01	7.92	8.02	7.97	7.98	7.99	7.92	7.93	8.03	8.01	7.88
	DO (mg/L)	7.8	7.8	7.9	7.9	8.1	7.9	7.8	7.7	7.7	7.7	7.9	8.2	8.2	8.2
	Conductivity (µmhos/cm)	150		141		148		149		140		139		146	
	Alkalinity (mg/L $CaCO_3$)	53				51				52					
	Hardness (mg/L $CaCO_3$)	57				59				54					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.5	25.2	25.1	24.9	24.9	25.1	25.2	25.1	25.1	24.7	25.1	25.3	24.9	24.8
100% Intake	pH (SU)	7.98	7.87	7.95	7.98	7.93	7.99	8.03	7.94	8.03	7.86	7.96	8.01	8.02	7.87
	DO (mg/L)	7.8	7.8	8.0	7.8	8.2	7.8	7.8	7.8	7.8	7.7	8.0	8.1	8.0	8.1
	Conductivity (µmhos/cm)	145		142		135		143		146		140		144	
	Alkalinity (mg/L $CaCO_3$)	51				50				51					
	Hardness (mg/L $CaCO_3$)	59				54				59					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.5	25.0	25.1	24.9	24.8	25.1	25.2	25.1	25.1	24.9	25.1	25.2	24.7	24.7

Species: *Ceriodaphnia dubia* Date: 11-09-04
Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day 0		Day 1		Day 2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.06	8.01	8.02	8.08	7.98	8.07
	DO (mg/L)	7.8	7.9	7.8	7.8	7.9	7.8
	Conductivity (µmhos/cm)	299		295		296	
	Alkalinity (mg $CaCO_3$/L)	63		61		62	
	Hardness (mg $CaCO_3$/L)	89		83		83	
	Temperature (°C)	24.9	24.9	24.9	25.0	24.7	25.2
10.98%	pH (S.U.)	8.06	7.98	8.04	8.07	8.07	8.07
	DO (mg/L)	7.9	7.8	7.8	7.8	7.9	7.8
	Conductivity (µmhos/cm)	285		283		286	
	Temperature (°C)	24.9	25.1	24.9	24.9	24.8	25.3
22%	pH (S.U.)	8.06	7.98	8.04	8.07	8.07	8.07
	DO (mg/L)	8.0	7.8	7.8	7.8	8.0	7.9
	Conductivity (µmhos/cm)	271		263		267	
	Temperature (°C)	24.8	25.1	25.1	24.7	24.7	25.1
43.9%	pH (S.U.)	8.03	7.98	8.02	8.06	8.04	8.06
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9
	Conductivity (µmhos/cm)	237		228		225	
	Temperature (°C)	24.8	25.0	25.0	24.9	24.9	25.1
72%	pH (S.U.)	8.00	7.94	7.98	8.03	7.98	8.04
	DO (mg/L)	7.9	7.8	7.9	7.9	8.0	7.9
	Conductivity (µmhos/cm)	193		181		191	
	Temperature (°C)	24.6	25.0	24.9	24.8	24.9	25.2
100%	pH (S.U.)	7.97	7.91	7.94	8.01	7.92	8.02
	DO (mg/L)	7.8	7.8	7.9	7.9	8.1	7.9
	Conductivity (µmhos/cm)	150		141		148	
	Alkalinity (mg $CaCO_3$/L)	53				51	
	Hardness (mg $CaCO_3$/L)	57				59	
	TR chlorine (mg/L)	<0.10		k		<0.10	
	Temperature (°C)	24.5	25.2	25.1	24.9	24.9	25.1
100% Intake	pH (S.U.)	7.98	7.87	7.95	7.98	7.93	7.99
	DO (mg/L)	7.8	7.9	8.0	7.8	8.2	7.8
	Conductivity (µmhos/cm)	145		142		135	
	Alkalinity (mg $CaCO_3$/L)	51				50	
	Hardness (mg $CaCO_3$/L)	59				54	
	TR chlorine (mg/L)	<0.10		k		<0.10	
	Temperature (°C)	24.5	25.0	25.1	24.9	24.8	25.1
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated **Date:** 11-09-04

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concen-tration	Parameter								
CONTROL	pH (S.U.)	8.03	7.97	8.12	7.89	8.05	8.03	8.11	7.94
	DO (mg/L)	7.8	7.8	7.8	7.9	8.0	8.1	7.9	8.0
	Conductivity (µmhos/cm)	306		301		293		293	
	Alkalinity (mg $CaCO_3$/L)					61			
	Hardness (mg $CaCO_3$/L)					83			
	Temperature (°C)	25.2	25.0	25.2	24.9	25.0	25.1	24.8	24.8
10.98%	pH (S.U.)	8.15	8.00	8.13	7.94	7.99	8.06	8.10	7.95
	DO (mg/L)	8.0	7.8	7.8	7.7	8.0	8.2	8.0	8.0
	Conductivity (µmhos/cm)	287		285		280		290	
	Temperature (°C)	25.3	24.8	25.0	24.7	25.0	25.3	24.7	24.8
22%	pH (S.U.)	8.13	8.01	8.13	7.96	8.02	8.06	8.11	7.95
	DO (mg/L)	8.0	7.7	7.7	7.7	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	272		271		262		283	
	Temperature (°C)	25.1	24.9	25.0	24.7	24.9	25.1	24.7	24.8
43.9%	pH (S.U.)	8.09	8.02	8.09	7.97	8.01	8.06	8.07	7.94
	DO (mg/L)	8.0	7.8	7.7	7.8	8.0	8.2	8.2	8.1
	Conductivity (µmhos/cm)	238		237		229		236	
	Temperature (°C)	25.3	24.8	24.9	24.9	24.9	25.1	24.8	24.7
72%	pH (S.U.)	8.03	8.00	8.04	7.96	7.97	8.05	8.04	7.91
	DO (mg/L)	8.0	7.9	7.7	7.8	8.0	8.2	8.2	8.2
	Conductivity (µmhos/cm)	194		192		~~2~~ P 182		191	
	Temperature (°C)	25.3	25.1	24.9	24.8	25.2	25.3	24.8	24.8
100%	pH (S.U.)	7.97	7.98	7.99	7.92	7.93	8.03	8.01	7.88
	DO (mg/L)	7.8	7.7	7.7	7.7	7.9	8.2	8.2	8.2
	Conductivity (µmhos/cm)	149		140		139		146	
	Alkalinity (mg $CaCO_3$/L)			52					
	Hardness (mg $CaCO_3$/L)			54					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	25.1	25.1	24.7	25.1	25.3	24.9	24.8
100% Intake	pH (S.U.)	8.03	7.94	8.03	7.86	7.96	8.01	8.02	7.87
	DO (mg/L)	7.8	7.8	7.8	7.7	8.6	8.1	8.0	8.1
	Conductivity (µmhos/cm)	143		~~146~~ P 146		140		144	
	Alkalinity (mg $CaCO_3$/L)			51					
	Hardness (mg $CaCO_3$/L)			59					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	25.1	25.1	24.9	25.1	25.2	24.7	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, UV-Treated

Test dates: November 09 - 16, 2004

Project number: 1557

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)	8.11	7.94	8.06	7.87	8.04	7.89	8.15	7.66	8.15	7.71	8.05	7.75	8.04	7.95
	DO (mg/L)	7.9	7.9	7.8	7.6	7.8	7.5	7.9	6.9	7.8	7.2	8.0	7.6	8.1	8.1
	Conductivity (µmhos/cm)	310		310		303		301		301		285		303	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Temperature (°C)	24.9	24.6	24.9	24.3	24.9	24.7	24.8	24.7	24.9	24.6	24.9	25.1	25.3	24.9
10.98%	pH (SU)	8.09	7.88	8.05	7.85	8.01	7.86	8.12	7.66	8.12	7.66	8.04	7.73	8.10	7.96
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.5	8.0	7.0	7.7	7.2	8.0	7.6	8.2	8.1
	Conductivity (µmhos/cm)	290		277		283		280		291		269		295	
	Temperature (°C)	24.9	24.8	24.9	24.3	25.1	24.8	24.7	24.6	24.9	24.6	25.0	25.0	25.3	24.7
22%	pH (SU)	8.08	7.88	8.02	7.84	7.99	7.84	8.12	7.67	8.12	7.64	8.04	7.75	8.10	7.96
	DO (mg/L)	7.9	7.8	7.9	7.6	7.9	7.3	7.9	6.9	7.7	7.1	7.9	7.5	8.2	8.2
	Conductivity (µmhos/cm)	273		270		262		269		267		262		284	
	Temperature (°C)	24.7	24.6	24.7	24.2	25.0	24.8	24.8	24.7	25.2	24.6	25.0	24.9	25.4	24.7
43.9%	pH (SU)	8.07	7.86	8.03	7.82	7.98	7.83	8.08	7.66	8.12	7.63	8.01	7.72	8.06	7.94
	DO (mg/L)	7.9	7.8	8.0	7.6	7.9	7.3	7.8	6.9	7.7	7.0	8.0	7.5	8.2	8.2
	Conductivity (µmhos/cm)	240		235		236		240		235		233		240	
	Temperature (°C)	24.8	24.6	24.9	24.3	25.1	24.9	24.9	24.9	25.2	24.8	24.9	24.9	25.3	24.8
72%	pH (SU)	8.05	7.75	8.00	7.82	7.94	7.80	8.02	7.59	8.05	7.65	7.98	7.71	8.04	7.92
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.2	7.8	6.8	7.5	7.0	7.8	7.4	8.2	8.2
	Conductivity (µmhos/cm)	194		192		194		193		193		187		194	
	Temperature (°C)	24.8	24.7	25.1	24.2	25.3	24.6	25.1	24.9	25.2	24.6	24.8	24.8	25.4	24.7
100%	pH (SU)	8.02	7.73	7.94	7.80	7.90	7.80	7.97	7.65	8.00	7.64	7.96	7.81	7.99	7.88
	DO (mg/L)	7.8	7.5	7.8	7.5	7.9	7.2	7.6	7.1	7.6	7.2	7.9	7.4	8.2	8.1
	Conductivity (µmhos/cm)	152		145		150		149		139		142		145	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	24.7	24.7	25.1	24.4	25.3	24.9	25.1	24.8	25.4	24.9	24.8	24.7	25.2	24.9
100% Intake	pH (SU)	8.02	7.76	7.96	7.77	7.92	7.74	8.01	7.62	8.08	7.57	7.96	7.78	8.01	7.89
	DO (mg/L)	7.9	7.5	7.8	7.2	8.0	7.1	7.8	7.0	7.7	7.0	7.8	7.5	8.2	8.1
	Conductivity (µmhos/cm)	146		143		149		145		147		141		144	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	24.9	24.6	25.0	24.2	25.0	24.7	24.9	24.7	25.2	24.7	24.9	24.9	25.2	24.9

Species: *Pimephales promelas* Date: 11-09-04
Client: TVA / Sequoyah Nuclear Plant – UV-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.11	7.94	8.06	7.87	8.04	7.89
	DO (mg/L)	7.9	7.9	7.8	7.6	7.8	7.5
	Conductivity (µmhos/cm)	301		310		303	
	Temperature (°C)	24.9	24.6	24.9	24.3	24.9	24.7
10.98%	pH (S.U.)	8.09	7.88	8.05	7.85	8.01	7.86
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.5
	Conductivity (µmhos/cm)	290		277		283	
	Temperature (°C)	24.9	24.8	24.9	24.3	25.1	24.8
22%	pH (S.U.)	8.08	7.88	8.02	7.84	7.99	7.84
	DO (mg/L)	7.9	7.8	7.9	7.6	7.9	7.3
	Conductivity (µmhos/cm)	273		270		262	
	Temperature (°C)	24.7	24.6	24.7	24.2	25.0	24.8
43.9%	pH (S.U.)	8.07	7.86	8.03	7.82	7.98	7.83
	DO (mg/L)	7.9	7.8	8.0	7.6	7.9	7.3
	Conductivity (µmhos/cm)	240		235		236	
	Temperature (°C)	24.8	24.6	24.9	24.3	25.1	24.9
72%	pH (S.U.)	8.05	7.75	8.00	7.82	7.94	7.80
	DO (mg/L)	7.9	7.8	7.9	7.6	7.8	7.2
	Conductivity (µmhos/cm)	194		192		194	
	Temperature (°C)	24.8	24.7	25.1	24.2	25.3	24.6
100%	pH (S.U.)	8.02	7.73	7.94	7.80	7.90	7.80
	DO (mg/L)	7.8	7.5	7.8	7.5	7.9	7.2
	Conductivity (µmhos/cm)	152		145		150	
	Temperature (°C)	24.7	24.7	25.1	24.4	25.3	24.9
100% Intake	pH (S.U.)	8.02	7.76	7.96	7.77	7.92	7.74
	DO (mg/L)	7.9	7.5	7.8	7.2	8.0	7.1
	Conductivity (µmhos/cm)	146		143		149	
	Temperature (°C)	24.9	24.6	25.0	24.2	25.0	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 11-09-04
Client: TVA / Sequoyah Nuclear Plant – UV-treated

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concen-tration	Parameter								
CONTROL	pH (S.U.)	8.15	7.66	8.15	7.71	8.05	7.75	8.04	7.95
	DO (mg/L)	7.9	~~7.9~~ 6.9	7.8	7.2	8.0	7.6	8.1	8.1
	Conductivity (µmhos/cm)	301		301		285		303	
	Temperature (°C)	24.8	24.7	24.9	24.6	24.9	25.1	25.3	24.9
10.98%	pH (S.U.)	8.12	7.66	8.12	7.66	8.04	7.73	8.10	7.96
	DO (mg/L)	8.0	7.0	7.7	7.2	8.0	7.6	8.2	8.1
	Conductivity (µmhos/cm)	280		291		269		295	
	Temperature (°C)	24.7	24.6	24.9	24.6	25.0	25.0	25.3	24.7
22%	pH (S.U.)	8.12	7.67	8.12	7.64	8.04	7.75	8.10	7.96
	DO (mg/L)	7.9	6.9	7.7	7.1	7.9	7.5	8.2	8.2
	Conductivity (µmhos/cm)	269		267		262		284	
	Temperature (°C)	24.8	24.7	25.2	24.6	25.0	24.9	25.4	24.7
43.9%	pH (S.U.)	8.08	7.66	8.12	7.63	8.01	7.72	8.00	7.94
	DO (mg/L)	7.8	6.9	7.7	7.0	8.0	7.5	8.2	8.2
	Conductivity (µmhos/cm)	240		235		233		240	
	Temperature (°C)	24.9	24.9	25.2	24.8	24.9	24.9	25.3	24.8
72%	pH (S.U.)	8.02	7.59	8.05	7.65	7.98	7.71	8.04	7.92
	DO (mg/L)	7.8	6.8	7.5	7.0	7.8	7.4	8.2	8.2
	Conductivity (µmhos/cm)	193		193		187		194	
	Temperature (°C)	25.1	24.9	25.2	24.6	24.8	24.8	25.4	24.7
100%	pH (S.U.)	7.97	7.65	8.00	7.64	7.96	7.81	7.99	7.88
	DO (mg/L)	7.6	7.1	7.6	7.2	7.9	7.4	8.2	8.1
	Conductivity (µmhos/cm)	149		139		142		145	
	Temperature (°C)	25.1	24.8	25.4	24.9	24.8	24.7	25.2	24.9
100% Intake	pH (S.U.)	8.01	7.62	8.08	7.57	7.96	7.78	8.01	7.89
	DO (mg/L)	7.8 ~~7.5~~ c)	7.0	7.7	7.0	7.8	7.5	8.2	8.1
	Conductivity (µmhos/cm)	145		147		141		144	
	Temperature (°C)	24.9	24.7	25.2	24.7	24.9	24.9	25.2	24.9
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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:	INR 127
Date analyzed	11-09-04	Acid reagent:	INR 138

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 197	INSS 197

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 197	0.50	0.525	105 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
041109.01	DWASA	PALE YELLOW, PARTICLES	S <0.00137	
↓	Duplicate		D <0.000899	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0180
041109.02	HERCULES INC.	PALE YELLOW, PARTICLES	<0.000189
041109.11	WBNT-113 INTAKE	PALE YELLOW, PARTICLES	<0.00540
041109.09	WBNT-101 INTAKE	PALE YELLOW, PARTICLES	<0.00419
041109.07	WBNT-112	PALE(?) YELLOW, PARTICLES	<0.00345
041108.03	WAYNESVILLE	NO COLOR, PARTICLES	0.381
041108.02	SQN INTAKE	PALE YELLOW, PARTICLES	<0.0197
041109.08	WBNT-101	PALE YELLOW, CLEAR	<0.0161
041108.01	SQN - 101	NO COLOR, CLEAR	<0.00549
041109.10	WBNT-113	NO COLOR, CLEAR	<0.00513

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 197	0.50	0.458	91.6%

Reviewed by	KGK
Date reviewed	11-09-04

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:	INR 127
Date analyzed	11-11-04	Acid reagent:	INR 138

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 197	INSS 197

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 197	0.50	0.493	98.6 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
041111.05	WBNT - 113	PALE YELLOW,	S <0.00573	
↓	Duplicate	FEW PARTICLES	D <0.00513	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0141
041111.03	WBNT - 101	PALE YELLOW, CLEAR	<0.00334
041110.07	SQN -101	PALE YELLOW, FEW PARTICLES	<0.00193
041111.02	WBNT - 112	LIGHT YELLOW, FEW PARTICLES	<0.00175
041111.07	HERCULES	NO COLOR, PARTICLES	<0.00404
041111.04	WBNT-101 INTAKE	PALE YELLOW, PARTICLES	<0.00146
041110.10	WAYNESVILLE WWTP	PALE YELLOW, PARTICLES	0.160
041111.01	MARSHALL WWTP	PALE YELLOW, CLEAR	<0.00794
041111.06	WBNT - 113 INTAKE	PALE YELLOW, PARTICLES	<0.00445
041110.08	SQN 101 INTAKE	PALE YELLOW, PARTICLES	<0.00242

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 197	0.50	0.521	104.2 %

Reviewed by	KGV
Date reviewed	11-11-04

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	PCB	Iodide reagent:	INR 127
Date analyzed	11-13-2004	Acid reagent:	INR 138

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS 197	INSS 197

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 197	0.50	0.528	105.6%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
041112.01	SQN - 101	Tan, large particles	S 0.232	
↓	Duplicate		D 0.231	+ 0.4%

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00213
041112.02	SQN-intake	Pale yellow, particles	<0.00255
041113.07	WBN 101	Pale yellow, particles	<0.00206
041113.08	WBN ~~100~~ 101 intake	Clear, particles	<0.000136
041113.06	WBN 112	Pale yellow, cloudy	<0.000871
041113.09	WBN 113	Clear, floating particles	<0.000746
041113.10	WBN 113- intake	Clear, floating particles	<0.000611
041112.03	OWASA	Clear, floating particles	<0.000942
041112.04	Baxter	Clear, particles	<0.00133
041112.07	Comm- Scope	Pale yellow, particles	<0.000429

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 197	0.50	0.486	97.2%

Reviewed by	JC
Date reviewed	11-13-04

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	PCB	Iodide reagent:	INR 127
Date analyzed	11-13-2004	Acid reagent:	INR 138

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number		

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%)
	0.50		

PCB

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
041112.04	Waynesville	Clear, particles	S <0.000412	
04111205	Duplicate		D <0.000932	–

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		
041113.08	Spruce Pine WWTP	Clear, particles	<0.000807
041113.01	AAF McQuay	Pale yellow, particles	<0.000165
041113.02	Dynea	Pale yellow, Opaque	<0.000113
04111303	Johnston Co.	Pale yellow, particles	<0.000265
04111305	S. Cary WWTP	Pale yellow, particles	<0.000308
041113.04	N. Cary WWTP	Clear, particles	<0.000284

PCB

PCB

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 197	0.50	0.453	90.6%

Reviewed by	
Date reviewed	11-13-04

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst: CAJ
Date analyzed: 11-08-04

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
4.50	INR121	INR105	0.0	12.4	12.4	0.0202	10.1

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 224	100	100	12.4	22.3	9.9	10.1	100	100%

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%)
11-01-04	MHS H2O A	100	22.3	28.4	6.1	10.1	S 62	
↓	Duplicate	↓	28.4	34.6	6.2	↓	D 63	1.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 224	50	100	28.4	39.4	11.0	10.1	111

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%)
63	48	96%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
10-26-04	MHS H2O	100	39.4	45.3	5.9	10.1	60
11-01-04	MHS H2O B	↓	2.0	7.9	5.9	↓	60
↓	↓ C	↓	7.9	13.9	6.0	↓	61
↓	SSW H2O	↓	13.9	17.2	3.3	↓	33
11-05-04	SSW H2O	↓	17.2	20.5	3.3	↓	33
↓	MHS H2O	↓	20.5	26.7	6.2	↓	63
11-07-04	MHS H2O	↓	26.7	32.7	6.0	↓	61
↓	SSW H2O	↓	32.7	36.0	3.3	↓	33
04 1104.03	ENFIELD 2	↓	36.0	40.2	4.2	↓	42

Reviewed by: [illegible] Date reviewed: 11-18-04

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst	CAJ
Date analyzed	11-08-04

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 224	100	100	0.6	10.2	9.6	10.1	97	97%

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%)
041102.01	ENFIELD 1	100	10.2	14.4	4.2	10.1	S 42	
J	Duplicate	↓	14.4	18.6	4.2	↓	D 42	—

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 224	50	100	14.4	23.4	9.0	10.1	91

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%)
42	49	98%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
041106.19	ENFIELD 3	100	23.4	27.4	4.0	10.1	40
041102.06	JOHNSONVILLE 001	↓	27.4	36.2	8.8	↓	89
041102.07	JOHNSON, UPSTREAM		36.2	41.5	5.3		54
041102.05	INT'L PAPER		1.8	36.5	34.7		350
10-26-04	SALT H2O		36.5	47.5	11.0		110
11-01-04	SALT H2O		0.4	13.7	13.3		130
11-03-04	SALT H2O		13.7	27.3	13.6		140
11-06-04	SALT H2O		27.3	40.7	13.4		140
11-07-04	SALT H2O	↓	33.4	45.0	11.6	↓	120

Reviewed by: [signature] Date reviewed: 11-18-04

Alkalinity
(EPA Method 310.1)

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

Analyst: CAJ
Date analyzed: 11-15-04

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
4.39	INR 121	INR 105	0.0	12.5	12.5	0.0200	10.0

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%)
INSS 224	100	100	12.5	22.2	9.7	10.0	97	97%

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%)
11-09-04	MHS H2O A	100	22.2	28.4	6.2	10.0	S 62	
	Duplicate	↓	28.4	34.6	6.2	↓	D 62	—

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 224	50	100	28.4	39.5	11.1	10.0	111

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%)
62	49	98%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
11-08-04	MHS H2O	100	39.5	45.5	6.0	10.0	60
11-09-04	MHS H2O B	↓	0.6	6.7	6.1	↓	61
11-12-04	MHS H2O A		6.7	12.8	6.1		61
↓	↓ B		12.8	18.8	6.0		60
	↓ C		18.8	24.7	5.9		59
↓	SSW H2O		24.7	28.1	3.4		34
11-14-04	MHS H2O		28.1	34.1	6.0		60
041108.03	WAYNESVILLE 1		34.1	35.7	1.6		16
041110.09	↓ 2	↓	35.7	37.5	1.8	↓	18

Reviewed by: JH Date reviewed: 11-18-04

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

Analyst: CAJ
Date analyzed: 11-15-04

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%)
INSS 224	100	100	37.5	47.2	9.7	10.0	97	97%

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%)
041112.04	WAYNESVILLE 3	100	3.8	5.0	1.2	10.0	S 12	
↓	Duplicate	↓	5.0	6.2	1.2	↓	D 12	—

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 224	50	100	5.0	11.0	6.0	10.0	60

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%)
12	48	96%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
041108.01	SQN 1	100	11.0	16.3	5.3	10.0	53
041110.07	↓ 2	↓	16.3	21.4	5.1	↓	51
041112.01	↓ 3	↓	21.4	26.6	5.2	↓	52
041108.02	SQN INTAKE 1	↓	26.6	31.7	5.1	↓	51
041110.08	↓ 2	↓	31.7	36.7	5.0	↓	50
041112.02	↓ 3	↓	36.7	41.8	5.1	↓	51
041109.08	WBN 101 1	↓	41.8	47.4	5.6	↓	56
041111.03	↓ 2	↓	4.4	10.7	6.3	↓	63
041113.07	↓ 3	↓	10.7	17.3	6.6	↓	66

Reviewed by: [signature] Date reviewed: 11-18-04

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

Analyst	CAJ
Date analyzed	11-15-04

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: CAJ

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 224	100	100	17.3	27.0	9.7	10.0	97	97%

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%)
041109.09	WBN 101 INT.	100	27.0	32.3	5.3	10.0	S 53	
↓	Duplicate 1	↓	32.3	37.6	5.3	↓	D 53.	—

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 224	50	100	32.3	42.4	10.1	10.0	101

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%)
53	48	96%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
041111.04	WBN INT. 101 2	100	3.3	9.2	5.9	10.0	59
041113.08	↓ 3	↓	9.2	15.3	6.1	↓	61
041109.07	WBN 112 1	↓	15.3	26.2	10.9	↓	110 (109)
041111.02	↓ 2	↓	26.2	38.1	11.9	↓	120 (119)
041113.02	↓ 3	↓	1.4	8.9	7.5	↓	75
041109.10	WBN 113 1	↓	8.9	14.5	5.6	↓	56
041111.05	↓ 2	↓	14.5	20.9	6.4	↓	64
041113.09	↓ 3	↓	20.9	27.3	6.4	↓	64
041109.11	WBN 113 INT. 1	↓	27.3	32.6	5.3	↓	53

Reviewed by: [signature] Date reviewed: 11-18-04

Alkalinity
(EPA Method 310.1)

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

Analyst	CAJ
Date analyzed	11-15-04

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%)
INSS 224	100	100	32.6	42.3	9.7	10.0	97	97%

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%)
041111.06	WBN 113 INT. 2	100	10.5	16.6	6.1	10.0	S 61	
↓	Duplicate	↓	16.6	22.6	6.0	↓	D 60	1.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 224	50	100	16.6	27.4	10.8	10.0	108 ~~16%~~

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%)
60	48	96%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
041113.10	WBN 113 INT. 3	100	27.4	33.3	5.9	10.0	59
041106.03	HERCULES 1	↓	3.5	15.0	11.5	↓	120
041109.02	↓ 2	↓	15.0	27.2	12.2	↓	120
041111.07	↓ 3	↓	27.2	40.3	13.1	↓	130

CAJ

Reviewed by: [illegible]

Date reviewed: 11-18-04

Environmental Testing Solutions, Inc.

Total Hardness
(EPA Method 130.2)

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

Analyst	CAJ
Date analyzed	11-08-04

Time started 1352
End time 1481

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
INR125	INSS 172	0.0	9.9	9.9	0.0202	20.2

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 160	40	50	9.9	11.9	2.0	20.2	40	100%

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%)
10-26-04	MHS H2O	50	11.9	16.0	4.1	20.2	S 83	
↓	Duplicate	↓	16.0	20.1	4.1	↓	D 83	—

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 160	40	50	16.0	22.2	6.2	20.2	125

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%)
83	42	105%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank (should be = 0 mg $CaCO_3$/L)	50	0.0	0.0	0.0	20.2	ND
11-01-04	MHS H2O A		22.2	26.3	4.1		83 11-30-04
↓	↓ B		26.3	30.1	~~4.1~~ 3.8 11-30-04		~~83~~ 77 *
	↓ C		30.1	34.4	4.3		87
↓	SSW H2O		34.4	36.4	2.0		40 11-30-04
11-05-04	SSW H2O		36.4	38.1	~~2.1~~ 1.7 11-30-04		~~42~~ 34 *
↓	MHS H2O		38.1	42.5	4.4		89
11-07-04	MHS H2O		42.5	46.6	4.1		83
↓	SSW H2O		46.6	48.6	2.0		40
04 110201	ENFIELD 1	↓	2.6	4.3	1.7	↓	34

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 11-18-04

* Below EPA acceptance criteria. Initial quick-check = 84 mg/L for same water batch. [illegible]
86 mg/L for same

Environmental Testing Solutions, Inc.

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

Analyst	CAJ
Date analyzed	11-08-04

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 160	40	50	4.3	6.3	2.0	20.2	40	100%

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%)
~~INSS 160~~	ENFIELD 2	50	6.3	7.9	1.6	20.2	S 32	
D41184.03	Duplicate	↓	7.9	9.6	1.7	↓	D ~~34~~	6.1%

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 160	40	50	7.9	11.6	3.7	20.2	75

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%)
34	41	102.5%

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)						CAJ
041106.19	ENFIELD 3	50	11.6	13.3	1.7	20.2	34
041102.06	JOHNSONVILLE 001	↓	13.3	20.0	6.7	↓	140 (135)
041102.07	JOHNSONVILLE UPSTREAM	↓	20.0	23.0	3.0		61
041102.05	INT'L PAPER	25	23.0	27.7	4.7	(2)	190
17826	RUTHERFORDTON	50	27.7	29.3	1.6	↓	32

CAJ

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

Reviewed by: dl

Date reviewed: 11-18-04

Environmental Testing Solutions, Inc.

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

Analyst	CAJ
Date analyzed	11-15-04

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
WR 125	INSS 172	0.0	9.9	9.9	0.0202	20.2

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 160	40	50	9.9	11.9	2.0	20.2	40	100%

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%)
11-08-04	MHS H2O	50	11.9	16.0	4.1	20.2	S 83	
↓	Duplicate	↓	16.0	20.1	4.1	↓	D 83	—

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 160	40	50	16.0	22.1	6.1	20.2	123

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%)
83	40	100%

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	0.0	0.0	0.0	20.2	ND
11-09-04	MHS H2O A		22.1	26.2	4.1		83
↓	↓ B		26.2	30.3	4.1		83
11-12-04	MHS H2O A		30.3	34.4	4.1		83
↓	↓ B		34.4	38.5	4.1		83
	↓ C		38.5	42.6	4.1		83
↓	SSW H2O		42.6	44.7	2.1		42
11-14-04	MHS H2O		44.7	48.8	4.1		83
17890	WAYNESVILLE EFF	25	0.1	9.3	9.2	(2)	370
041108.03	WAYNESVILLE 1	50	9.3	15.4	6.1		120

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

Reviewed by: [signature]

Date reviewed: 11-18-04

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

Analyst	CAJ
Date analyzed	11-15-04

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

Laboratory control standard: CAJ

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 160	40	50	15.4	17.4	2.0	20.2	40	100%

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%)
041110.09	WAYNESVILLE 2	50	17.4	26.9	9.5	20.2	S 190	
↓	Duplicate	↓	26.9	36.4	9.5	↓	D 190	—

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 160	40	50	26.9	38.4	11.5	20.2	230

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%)
190	40	100%

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)	—					CAJ
041112.04	WAYNESVILLE 3	250 CJ	5.1	13.5	8.4	(2) 20.2	340
041108.01	SQN 1	50	13.5	16.3	2.8	↓	57
041110.07	↓ 2	↓	16.3	19.2	2.9	↓	59
041112.01	↓ 3	↓	19.2	21.9	2.7	↓	54
041108.02	SQN INTAKE 1	↓	21.9	24.8	2.9	↓	59
041110.08	↓ 2	↓	24.8	27.5	2.7	↓	54
041112.02	↓ 3	↓	27.5	30.4	2.9	↓	59
041109.08	WBN 101 1	↓	30.4	33.6	3.2	↓	65
041111.03	↓ 2	↓	33.6	37.0	3.4	↓	69

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: JI Date reviewed 11-18-04

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

Analyst	CAJ
Date analyzed	11-15-04

~~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%)
WSS 160	40	50	37.0	39.0	2.0	20.2	40	100%

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%)
041113.07	WBN 101 3	50	39.0	42.6	3.6	20.2	S 73	
↓	Duplicate	↓	42.6	46.3	3.7	↓	D 75	2.7%

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)
WSS 160	40	50	42.6	48.3	5.7	20.2	115

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%)
75	40	100%

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)						CAJ
041109.09	WBN 101 INT. 1	50	0.9	3.8	2.9	20.2	~~56~~ 59
041111.04	↓ 2	↓	3.8	7.2	3.4	↓	69
041113.08	↓ 3	↓	7.2	10.6	3.4	↓	69
041109.07	WBN 112 1	↓	10.6	17.0	6.4	↓	~~130~~ (129)
041111.02	↓ 2	↓	17.0	24.0	7.0	↓	~~140~~ (141)
041113.06	↓ 3	↓	24.0	28.7	4.7	↓	95
041109.10	WBN 113 1	↓	28.7	31.8	3.1	↓	63
041111.05	↓ 2	↓	31.8	35.3	3.5	↓	71
041113.09	↓ 3	↓	35.3	38.8	3.5	↓	71

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: dl Date reviewed 11-18-04

Environmental Testing Solutions, Inc.

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

Analyst	CAJ
Date analyzed	11-15-04

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 160	40	50	38.8	40.8	2.0	20.2	40	100%

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%)
04 1109.11	WBN 113 INT.	50	20.5	23.4	2.9	20.2	S 59	
↓	Duplicate 1	↓	23.4	26.3	2.9	↓	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 hardness (A) (mg $CaCO_3$/L)
INSS 160	40	50	23.4	28.3	4.9	20.2	99

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%)
59	40	100%

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)						CAJ
04 1111.06	WBN 113 INT. 2	50	28.3	31.6	3.3	20.2	67
04 1113.10	↓ 3	↓	31.6	34.9	3.3	↓	67

CAJ

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

Reviewed by: JL

Date reviewed: 11-18-04

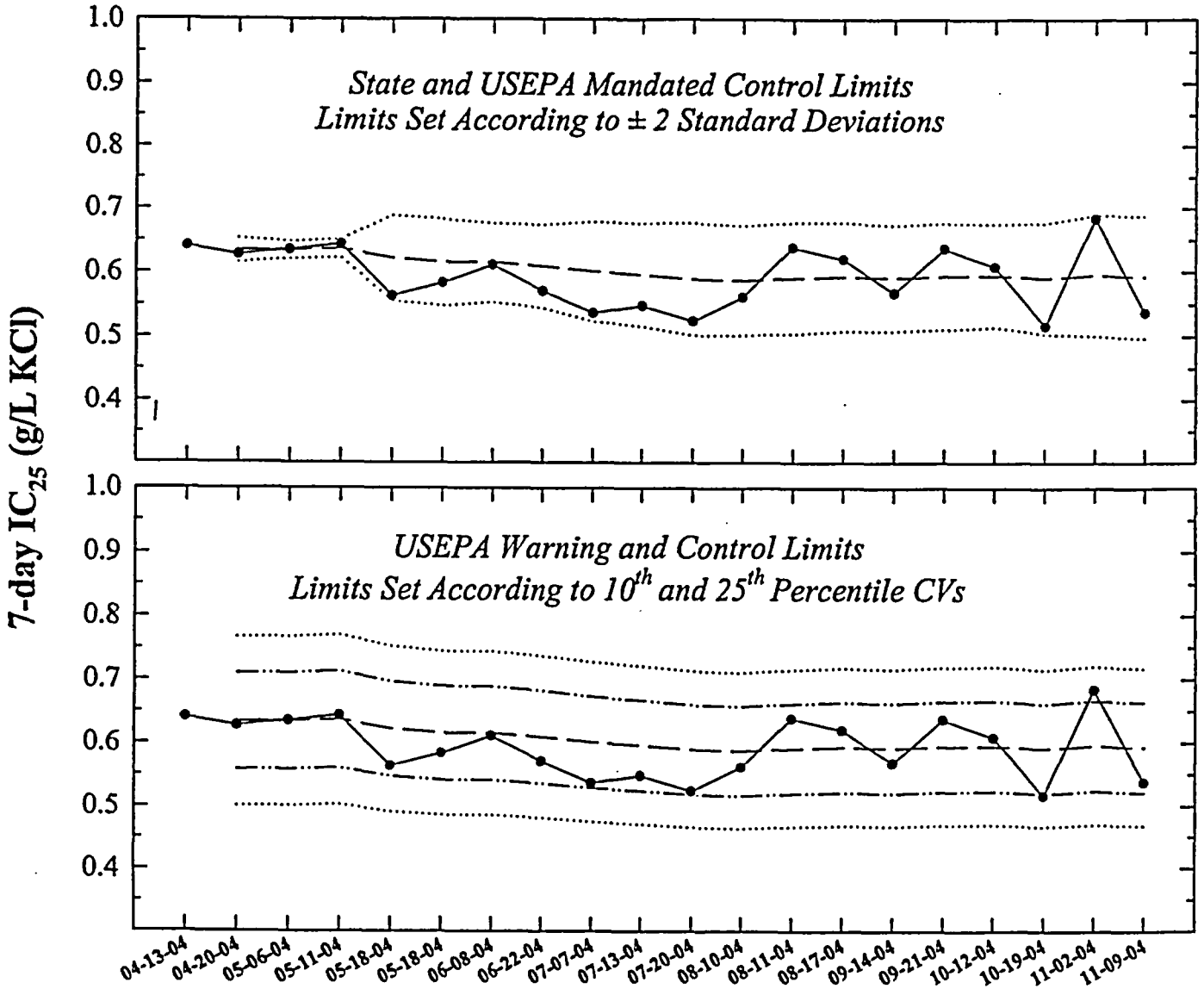
Sequoyah Nuclear Plant Biomonitoring
November 9-16, 2004

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	04-13-04	0.64																	
2	04-20-04	0.63	0.63	0.01	0.61	0.65	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.87	0.29	0.35	0.92	0.01
3	05-06-04	0.63	0.63	0.01	0.62	0.65	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.87	0.29	0.35	0.92	0.01
4	05-11-04	0.64	0.64	0.01	0.62	0.65	0.08	0.56	0.71	0.13	0.50	0.77	0.24	0.39	0.88	0.29	0.35	0.92	0.01
5	05-18-04	0.56	0.62	0.03	0.56	0.69	0.07	0.55	0.70	0.13	0.49	0.75	0.24	0.39	0.86	0.28	0.34	0.90	0.05
6	05-18-04	0.58	0.62	0.03	0.55	0.68	0.07	0.54	0.69	0.13	0.49	0.74	0.23	0.38	0.85	0.28	0.34	0.89	0.05
7	06-08-04	0.61	0.61	0.03	0.55	0.68	0.07	0.54	0.69	0.13	0.49	0.74	0.23	0.38	0.85	0.28	0.34	0.89	0.05
8	06-22-04	0.57	0.61	0.03	0.54	0.67	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.33	0.88	0.05
9	07-07-04	0.54	0.60	0.04	0.52	0.68	0.07	0.53	0.67	0.13	0.47	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.06
10	07-13-04	0.55	0.60	0.04	0.52	0.68	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
11	07-20-04	0.52	0.59	0.04	0.50	0.68	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.81	0.27	0.32	0.85	0.07
12	08-10-04	0.56	0.59	0.04	0.50	0.67	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.07
13	08-11-04	0.64	0.59	0.04	0.50	0.68	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.82	0.27	0.32	0.86	0.07
14	08-17-04	0.62	0.59	0.04	0.51	0.68	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
15	09-14-04	0.57	0.59	0.04	0.51	0.67	0.07	0.52	0.66	0.12	0.47	0.72	0.22	0.37	0.82	0.27	0.33	0.86	0.07
16	09-21-04	0.64	0.59	0.04	0.51	0.68	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
17	10-12-04	0.61	0.59	0.04	0.51	0.68	0.07	0.52	0.67	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.07
18	10-19-04	0.52	0.59	0.04	0.50	0.68	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.82	0.27	0.32	0.86	0.07
19	11-02-04	0.68	0.60	0.05	0.50	0.69	0.07	0.52	0.67	0.13	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.08
20	11-09-04	0.54	0.59	0.05	0.50	0.69	0.07	0.52	0.66	0.12	0.47	0.72	0.23	0.37	0.82	0.27	0.33	0.86	0.08

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)

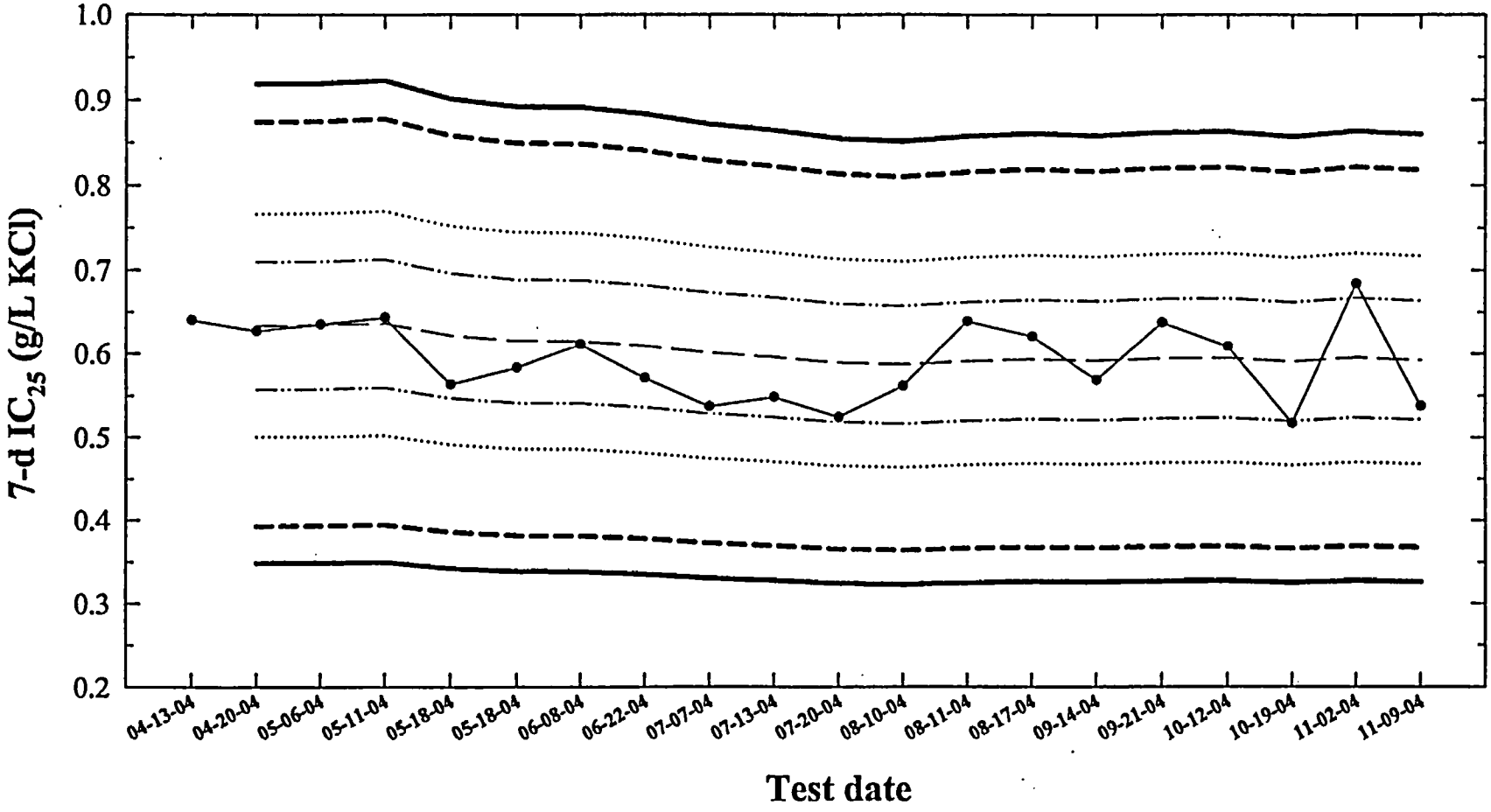
CV = Coefficient of variation of the IC_{25} values.

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	04-13-04	100	0.780		9.8		0.11	13.9	
2	04-20-04	100	0.784	0.782	5.5	7.6	0.08	10.2	12.1
3	05-06-04	100	0.832	0.799	5.5	6.9	0.10	12.2	12.1
4	05-11-04	97.5	0.655	0.763	13.1	8.5	0.11	17.1	13.4
5	05-18-04	100	0.718	0.754	4.4	7.7	0.08	10.5	12.8
6	05-18-04	100	0.681	0.742	9.3	7.9	0.12	17.8	13.6
7	06-08-04	100	0.859	0.758	1.3	7.0	0.08	9.6	13.0
8	06-22-04	100	0.700	0.751	15.1	8.0	0.12	16.8	13.5
9	07-07-04	100	0.610	0.735	11.1	8.4	0.08	13.6	13.5
10	07-13-04	100	0.805	0.742	10.2	8.5	0.12	15.4	13.7
11	07-20-04	100	0.727	0.741	15.6	9.2	0.17	23.4	14.6
12	08-10-04	100	0.490	0.720	11.6	9.4	0.07	14.7	14.6
13	08-11-04	100	0.673	0.716	3.6	8.9	0.12	18.4	14.9
14	08-17-04	100	0.682	0.714	7.4	8.8	0.10	14.4	14.9
15	09-14-04	100	0.825	0.721	12.9	9.1	0.13	15.4	14.9
16	09-21-04	97.5	0.700	0.720	15.8	9.5	0.12	16.4	15.0
17	10-12-04	100	0.759	0.722	12.9	9.7	0.17	22.1	15.4
18	10-19-04	100	0.757	0.724	1.1	9.2	0.09	12.3	15.2
19	11-02-04	100	0.756	0.726	10.9	9.3	0.15	19.3	15.4
20	11-09-04	100	0.609	0.720	7.8	9.2	0.11	18.0	15.6

Note:

CV = Coefficient of variation for control growth.
On average, the CV for control growth is 9.2% 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 15.6% 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.

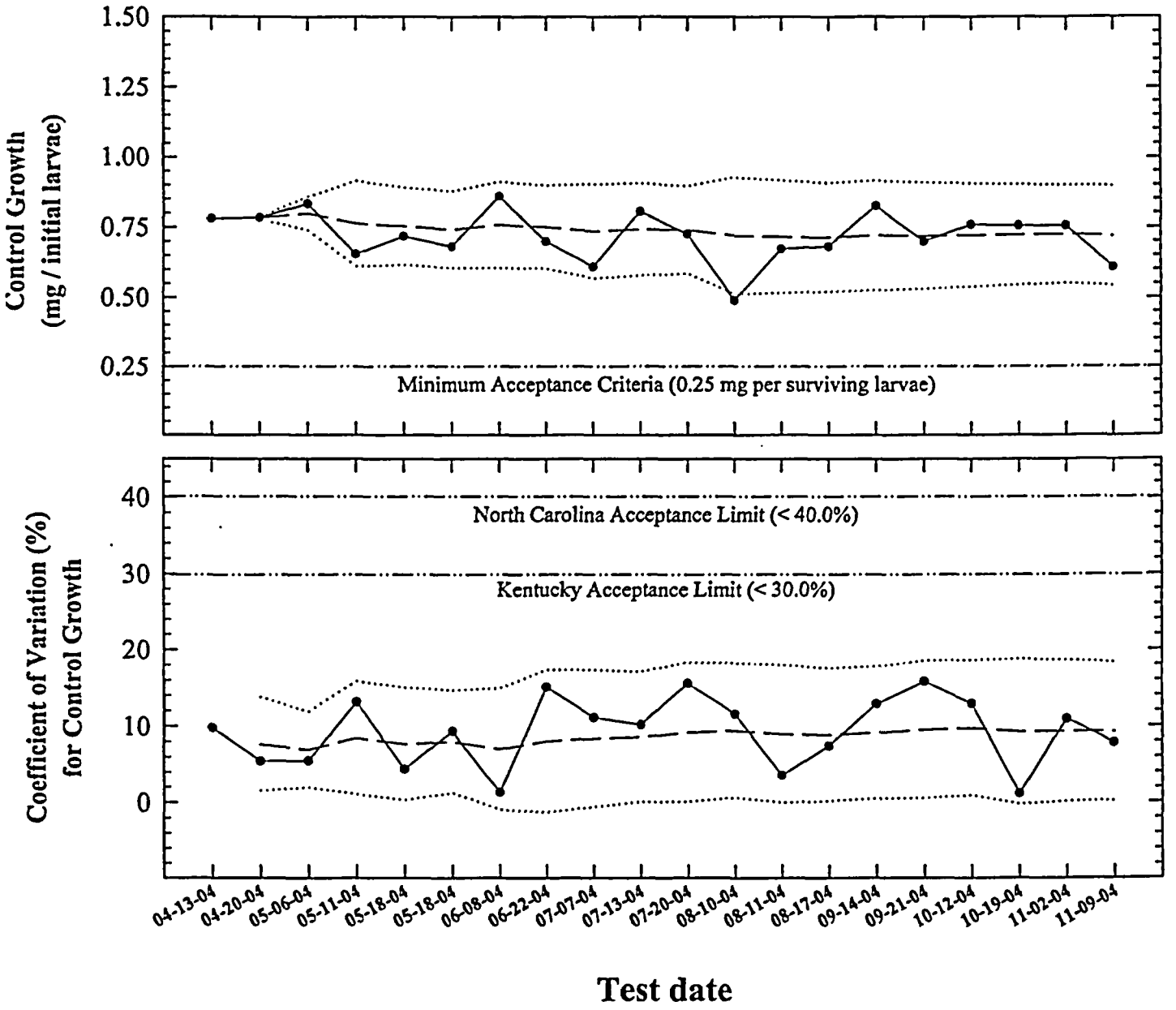
USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatic BioSystems, Inc.

11-09-04

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)

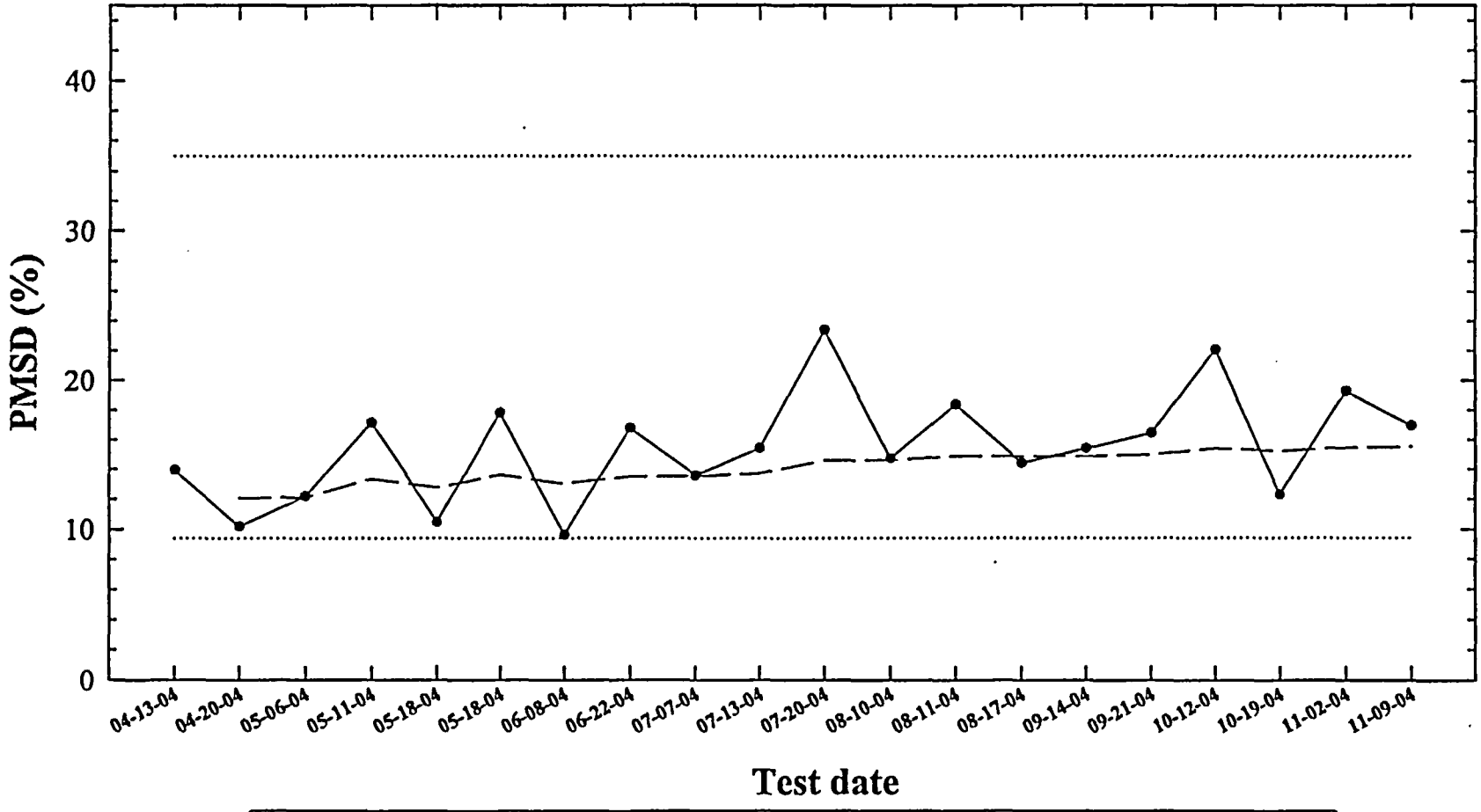
— — Central Tendency (mean Control Growth or CV)

····· 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.)

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

PpKClCR Test Number: 49

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM 142					
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:	21.25 TO 22.75 HOURS OLD	Randomizing template:	RED
Date and times organisms were born between:	11-08-04 1400 TO 1530	Incubator number and shelf location:	3F
Organism source:	ABS BATCH 11-08-04	*Artemia* lot number:	BG10055
Transfer bowl information:	pH = 7.98 SU Temperature = 24.0 °C	Total drying time:	24 HOURS
		Date / Time in:	11-16-04 1320
Average transfer volume:	9.5 ml	Date / Time out:	11-17-04 1330
		Oven temperature:	61°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Analyst
0	11-09-04	—	1400	1238	11-05-04	JH
1	11-10-04	0850	1502	1150	11-07-04	JH
2	11-11-04	0900	1505	1142	11-09-04	JH
3	11-12-04	0913	1522	1145	11-09-04	JH
4	11-13-04	0903	1500	1140	11-09-04	JH
5	11-14-04	0847	1506	1151	11-12-04	KEK
6	11-15-04	0850	1500	1143	11-12-04	JH
7	11-16-04			1149		KEK

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	699.1
Average weight per initial larvae:	0.609		NOEC	450
Average weight per surviving larvae:	0.609	≥ 0.25 mg/larvae	LOEC	600
			ChV	519.6
			IC_{25}	537.6

Species: *Pimephales promelas* PpKClCR Test Number: 49

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	9 1d	10	10	10	10	10
3	10	10	10	10	10	10	9	10	10	10	10	10
4	10	10	10	10	10	10	9	10	10	10	10	10
5	10	10	10	10	10	10	9	10	10	10	10	10
6	10	10	10	10	10	10	9	10	10	10	10	10
7	10	10	10	10	10	10	1 sk 9	10	10	10	9 1d	10
A = Pan weight (mg) Tray color code:: BLACK Analyst: CAJ TAM	14.93	14.92	14.55	14.81	15.03	14.51	15.23	15.19	14.73	14.72	14.70	14.85
B = Pan + Larvae weight (mg) Analyst: CAJ	20.31	21.18	20.97	21.10	20.76	20.56	18.81	20.66	20.33	19.92	19.74	19.96
Larvae weight (mg) = A – B	5.38	6.26	6.42	6.29	5.73	6.05	3.58	5.47	5.60	5.20	5.04	5.11
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.538	0.626	0.642	0.629	0.573	0.605	0.358	0.547	0.560	0.520	0.504	0.511
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.609				0.521		14.5%		0.524		14.0%	

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: dl

Comments:

Species: *Pimephales promelas* PpKClCR Test Number: 49

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	8 2d	10	10	10	8 2d	9 1d	8 2d	9 1d	6 4d	5 5d	6 4d	6 4d
2	8	10	9 1d	10	8	9	8	9	6	4 1d	4 2d	5 1d
3	8	10	9	10	8	9	7 1d	9	5 1d	3 1d	4	4 1d
4	8	10	9	10	8	9	7	9	4 1d	3	4	4
5	8	9 1d	9	10	7 1d	9	7	9	4	2 1d	3 1d	4
6	8	9	9	10	7	9	7	9	3 1d	1 1d	3	4
7	8	8 1d	8 1d	8 2d	3 4d	4 5d	4 5d	3 6d	1 2d	D 1d	3	2 2d
A = Pan weight (mg) Tray color code:: BLACK Analyst: CAJ	14.72	14.98	14.92	14.42	14.63	14.63	10.91	14.80	15.22	15.21	14.70	14.45
B = Pan + Larvae weight (mg) Analyst: CAJ	19.15 19.74	18.69	19.17	18.42	16.10	16.25	19.27	16.22	16.04	0	17.51	15.89
Larvae weight (mg) = A – B	4.43	3.71	4.25	4.00	1.47	1.62	2.36	1.42	0.82	0	2.81	1.44
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.443	0.371	0.425	0.400	0.147	0.162	0.236	0.142	0.082	0	0.281	0.144
Average weight per initial number of larvae (mg)	0.410				0.172				0.127			
Percent reduction from control (%)		32.7%				71.8%				79.2%		

Comment codes: c = clear, d = dead, fg = fungus, k = killed, m = missing, sk = sick, sm = unusually small, lg = unusually large, d&r = decanted and returned, w = wounded.

Calculations and data reviewed: [illegible]

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

Test number: PpKCKCR # 89 (#49 at 351 Depot St.)
Test dates: November 9-16, 2004

Reviewed by: [signature]

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 / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.93	20.31	5.38	0.538	0.609	7.8	0.538	100.0	0.609	7.8	Not applicable
	B	10	10	14.92	21.18	6.26	0.626			0.626				
	C	10	10	14.55	20.97	6.42	0.642			0.642				
	D	10	10	14.81	21.10	6.29	0.629			0.629				
300	E	10	10	15.03	20.76	5.73	0.573	0.531	17.3	0.573	97.5	0.521	21.3	14.5
	F	10	10	14.51	20.56	6.05	0.605			0.605				
	G	10	9	15.23	18.81	3.58	0.398			0.358				
	H	10	10	15.19	20.66	5.47	0.547			0.547				
450	I	10	10	14.73	20.33	5.60	0.560	0.538	4.8	0.560	97.5	0.524	4.8	14.0
	J	10	10	14.72	19.92	5.20	0.520			0.520				
	K	10	9	14.70	19.74	5.04	0.560			0.504				
	L	10	10	14.85	19.96	5.11	0.511			0.511				
600	M	10	8	14.72	19.15	4.43	0.554	0.512	7.6	0.443	80.0	0.410	7.6	32.7
	N	10	8	14.98	18.69	3.71	0.464			0.371				
	O	10	8	14.92	19.17	4.25	0.531			0.425				
	P	10	8	14.42	18.42	4.00	0.500			0.400				
750	Q	10	3	14.63	16.10	1.47	0.490	0.490	15.6	0.147	35.0	0.172	25.4	71.8
	R	10	4	14.63	16.25	1.62	0.405			0.162				
	S	10	4	16.91	19.27	2.36	0.590			0.236				
	T	10	3	14.80	16.22	1.42	0.473			0.142				
900	U	10	1	15.22	16.04	0.82	0.820	0.826	13.1	0.082	15.0	0.127	93.5	79.2
	V	10	0	0.00	0.00	0.00	0.000			0.000				
	W	10	3	14.70	17.51	2.81	0.937			0.281				
	X	10	2	14.45	15.89	1.44	0.720			0.144				

Dunnett's MSD value: 0.1098
PMSD: 18.0

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 15.6% 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.

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	11/9/2004	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	11/16/2004	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

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

			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	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
300	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
450	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
*600	0.8000	0.8000	1.1071	1.1071	1.1071	0.000	4	10.00	10.00	8	40
*750	0.3500	0.3500	0.6322	0.5796	0.6847	9.597	4	10.00	10.00	26	40
*900	0.1500	0.1500	0.3810	0.1588	0.5796	47.729	4	10.00	10.00	34	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.895531535	0.884	-0.5410818	2.596877195
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	450	600	519.6152423	
Treatments vs D-Control				

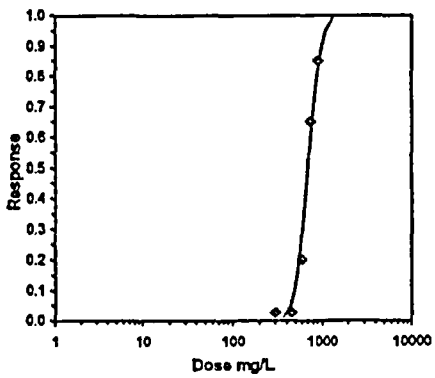
Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.398696931	3.366205684	-2.3140717	19.11146556	0	25.42745675	7.814727783	1.3E-05	2.844518145	0.119066089	4
Intercept	-18.8902458	9.550874232	-49.2853896	11.50489799							

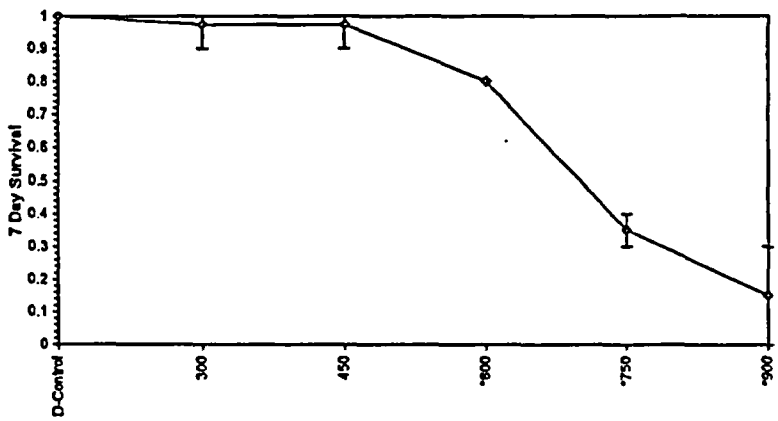
TSCR

Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	369.4273116	
EC05	3.355	445.3196461	
EC10	3.718	491.9588902	
EC15	3.964	526.155457	
EC20	4.158	555.0212338	
EC25	4.326	581.0443574	
EC40	4.747	652.1584076	
EC50	5.000	699.0659461	
EC60	5.253	749.3473942	
EC75	5.674	841.0600443	
EC80	5.842	880.4946016	
EC85	6.036	928.8000412	
EC90	6.282	993.3618147	
EC95	6.645	1097.39865	
EC99	7.326	1322.840041	

Significant heterogeneity detected (p = 1.26E-05)



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/9/2004	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	11/16/2004	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.5380	0.6260	0.6420	0.6290
300	0.5730	0.6050	0.3580	0.5470
450	0.5600	0.5200	0.5040	0.5110
600	0.4430	0.3710	0.4250	0.4000
750	0.1470	0.1620	0.2360	0.1420
900	0.0820	0.0000	0.2810	0.1440

			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	0.6088	1.0000	0.6088	0.5380	0.6420	7.832	4				0.6088	1.0000
300	0.5208	0.8554	0.5208	0.3580	0.6050	21.327	4	1.746	2.180	0.1098	0.5223	0.8579
450	0.5238	0.8604	0.5238	0.5040	0.5600	4.781	4	1.687	2.180	0.1098	0.5223	0.8579
600	0.4098	0.6731	0.4098	0.3710	0.4430	7.633	4				0.4098	0.6731
750	0.1718	0.2821	0.1718	0.1420	0.2360	25.425	4				0.1718	0.2821
900	0.1268	0.2082	0.1268	0.0000	0.2810	93.527	4				0.1268	0.2082

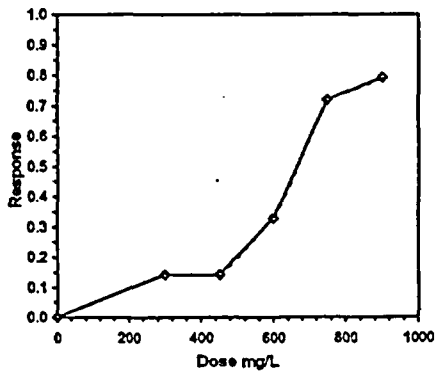
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.870173097	0.805	-1.55527319	3.162416858
Bartlett's Test indicates equal variances (p = 0.07)	5.247608185	9.2103405		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	>450			0.109849617	0.180451116	0.009985333	0.00507825	0.195662111	2, 9
Treatments vs D-Control										

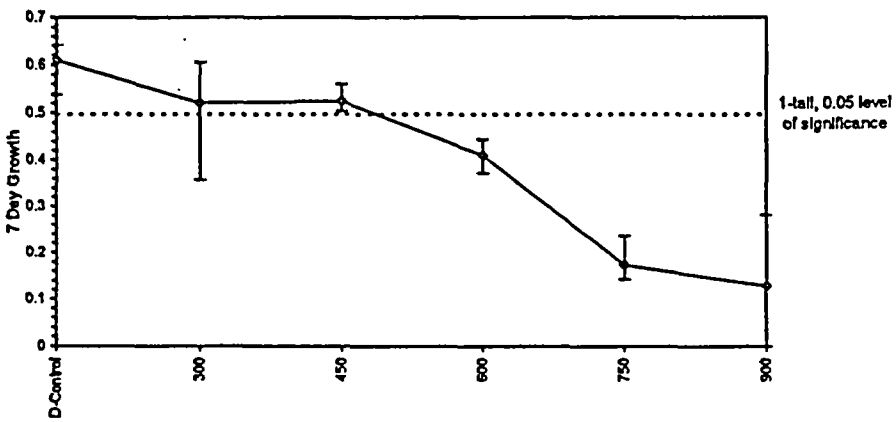
Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	105.56	93.66	42.68	529.28	1.0619
IC10*	211.13	108.23	85.36	614.46	0.4423
IC15	456.42	108.32	44.21	532.87	-0.4982
IC20	497.00	77.10	125.88	576.38	-2.0308
IC25	537.58	42.08	439.61	624.40	-3.2045
IC40	628.05	10.95	596.86	663.02	0.1345
IC50	666.41	9.76	640.69	699.57	0.2868

* Indicates IC estimate less than the lowest concentration



Dose-Response Plot



Species: *Pimephales promelas* PpKClCR Test Number: 49

Daily Chemistry:

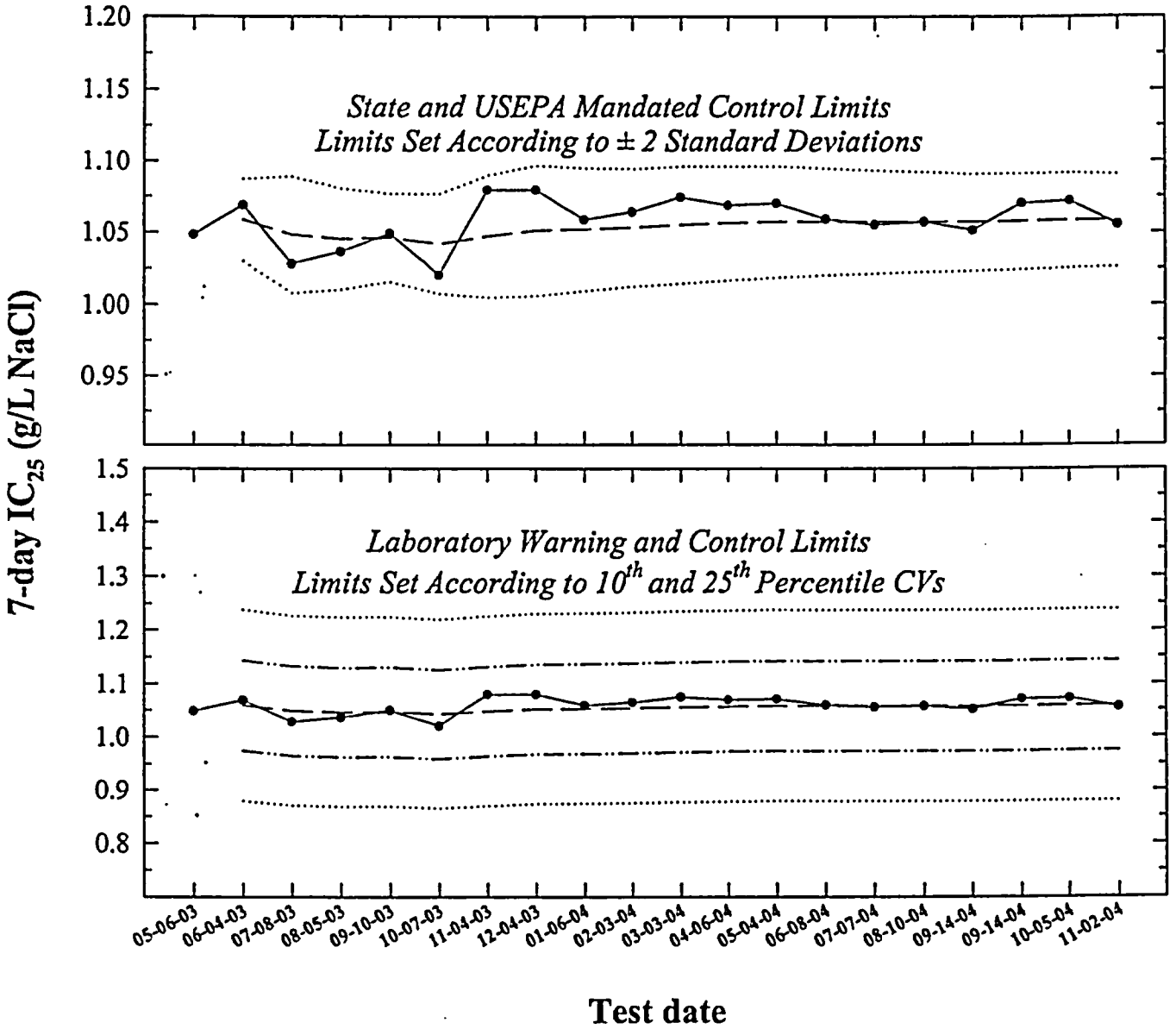
		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	8.06	7.89	8.02	7.87	7.98	7.84
	DO (mg/L)	7.8	7.7	7.8	7.5	7.9	7.0
	Conductivity (µmhos/cm)	299		295		296	
	Alkalinity (mg $CaCO_3$/L)	63		61		62	
	Hardness (mg $CaCO_3$/L)	89		83		83	
	Temperature (°C)	24.8	24.5	24.7	24.3	24.9	24.4
300 mg KCl/L	pH (S.U.)	8.11	7.92	8.04	7.91	8.05	7.88
	DO (mg/L)	7.8	7.7	7.8	7.4	8.0	7.0
	Conductivity (µmhos/cm)	860		835		819	
	Temperature (°C)	24.8	24.4	24.7	24.3	24.8	24.5
450 mg KCl/L	pH (S.U.)	8.10	7.95	8.05	7.89	8.07	7.90
	DO (mg/L)	8.0	7.7	8.0	7.5	8.0	7.0
	Conductivity (µmhos/cm)	1200		1220		1110	
	Temperature (°C)	24.8	24.3	24.9	24.2	24.9	24.5
600 mg KCl/L	pH (S.U.)	8.10	7.93	8.05	7.88	8.07	7.90
	DO (mg/L)	8.0	7.8	8.0	7.5	8.1	7.1
	Conductivity (µmhos/cm)	1470		1530		1370	
	Temperature (°C)	25.1	24.5	24.9	24.4	24.8	24.7
750 mg KCl/L	pH (S.U.)	8.10	7.94	8.04	7.90	8.08	7.86
	DO (mg/L)	7.9	7.8	8.0	7.4	8.0	7.1
	Conductivity (µmhos/cm)	1730		1800		1620	
	Temperature (°C)	24.9	24.3	24.9	24.3	24.6	24.3
900 mg KCl/L	pH (S.U.)	8.09	7.95	8.05	7.95	8.09	7.91
	DO (mg/L)	8.0	7.9	8.0	7.4	8.0	7.2
	Conductivity (µmhos/cm)	2000		2020		1890	
	Temperature (°C)	24.8	24.5	24.9	24.2	24.8	24.5
STOCK	Conductivity (µmhos/cm)	79500		80700		76700	
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* PpKClCR Test Number: 49

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.03	7.67	8.12	7.65	8.05	7.75	8.11	7.86
	DO (mg/L)	7.8	7.0	7.8	7.0	8.0	7.3	7.9	7.7
	Conductivity (µmhos/cm)	306		301		293		293	
	Alkalinity (mg $CaCO_3$/L)					61			
	Hardness (mg $CaCO_3$/L)					83			
	Temperature (°C)	24.9	24.5	24.9	24.8	24.9	24.9	25.3	25.4
300 mg KCl/L	pH (S.U.)	8.13	7.61	8.18	7.58	8.05	7.80	8.13	7.93
	DO (mg/L)	7.8	7.0	7.8	7.1	8.1	7.3	7.9	7.7
	Conductivity (µmhos/cm)	825		815		811		828	
	Temperature (°C)	25.0	24.5	24.9	25.1	25.0	24.9	25.2	25.4
450 mg KCl/L	pH (S.U.)	8.15	7.72	8.18	7.63	8.06	7.78	8.13	7.95
	DO (mg/L)	7.7	7.1	7.7	7.0	8.0	7.4	7.9	7.9
	Conductivity (µmhos/cm)	1180		1070		1090		1140	
	Temperature (°C)	25.1	24.5	24.7	24.8	25.0	25.0	25.4	25.4
600 mg KCl/L	pH (S.U.)	8.16	7.65	8.18	7.65	8.05	7.79	8.13	7.93
	DO (mg/L)	7.8	7.2	7.7	7.1	8.0	7.4	8.0	7.9
	Conductivity (µmhos/cm)	1460		1430		1420		1420	
	Temperature (°C)	25.1	24.5	24.7	25.0	25.0	24.9	25.2	25.1
750 mg KCl/L	pH (S.U.)	8.17	7.68	8.19	7.65	8.05	7.77	8.13	7.93
	DO (mg/L)	7.8	7.2	7.7	7.1	7.9	7.4	8.0	7.9
	Conductivity (µmhos/cm)	1740		1720		1680		1670	
	Temperature (°C)	24.8	24.4	24.6	24.7	24.9	24.9	25.2	25.5
900 mg KCl/L	pH (S.U.)	8.16	7.69	8.18	7.67	8.05	7.78	8.13	7.95
	DO (mg/L)	7.8	7.2	7.8	7.1	8.0	7.4	8.0	7.9
	Conductivity (µmhos/cm)	1980		1990		1950		1910	
	Temperature (°C)	25.1	24.4	24.8	24.8	24.9	24.7	25.2	25.3
STOCK	Conductivity (µmhos/cm)	81600		78600		79700		76300	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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	State and USEPA Control Limits CT + 2S	S_{A10}	Laboratory Warning Limits CT - S_{A10}	Laboratory Warning Limits CT + S_{A10}	S_{A25}	Laboratory Control Limits CT - S_{A25}	Laboratory Control Limits CT + S_{A25}	S_{A75}	USEPA Warning Limits CT - S_{A75}	USEPA Warning Limits CT + S_{A75}	S_{A90}	USEPA Control Limits CT - S_{A90}	USEPA Control Limits CT + S_{A90}	CV
1	05-06-03	1.05																	
2	06-04-03	1.07	1.06	0.01	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.01
3	07-08-03	1.03	1.05	0.02	1.01	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
4	08-05-03	1.04	1.05	0.02	1.01	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	0.02
5	09-10-03	1.05	1.05	0.02	1.02	1.08	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.58	1.52	0.65	0.40	1.69	0.01
6	10-07-03	1.02	1.04	0.02	1.01	1.08	0.08	0.96	1.13	0.18	0.86	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.02
7	11-04-03	1.08	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
8	12-04-03	1.08	1.05	0.02	1.01	1.10	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.52	0.65	0.40	1.70	0.02
9	01-06-04	1.06	1.05	0.02	1.01	1.09	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.53	0.65	0.40	1.70	0.02
10	02-03-04	1.06	1.05	0.02	1.01	1.09	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.53	0.65	0.40	1.71	0.02
11	03-03-04	1.07	1.06	0.02	1.01	1.10	0.08	0.97	1.14	0.18	0.88	1.23	0.47	0.58	1.53	0.65	0.40	1.71	0.02
12	04-06-04	1.07	1.06	0.02	1.02	1.10	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.65	0.40	1.71	0.02
13	05-04-04	1.07	1.06	0.02	1.02	1.10	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
14	06-08-04	1.06	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
15	07-07-04	1.06	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
16	08-10-04	1.06	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
17	09-14-04	1.05	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
18	09-14-04	1.07	1.06	0.02	1.02	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
19	10-05-04	1.07	1.06	0.02	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	0.02
20	11-02-04	1.06	1.06	0.02	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.53	0.66	0.40	1.71	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_{A10} = Standard deviation corresponding to the 10th percentile CV. (S_{A10} = 0.08)

S_{A25} = Standard deviation corresponding to the 25th percentile CV. (S_{A25} = 0.17)

USEPA Control and Warning Limits

S_{A75} = Standard deviation corresponding to the 75th percentile CV. (S_{A75} = 0.45)

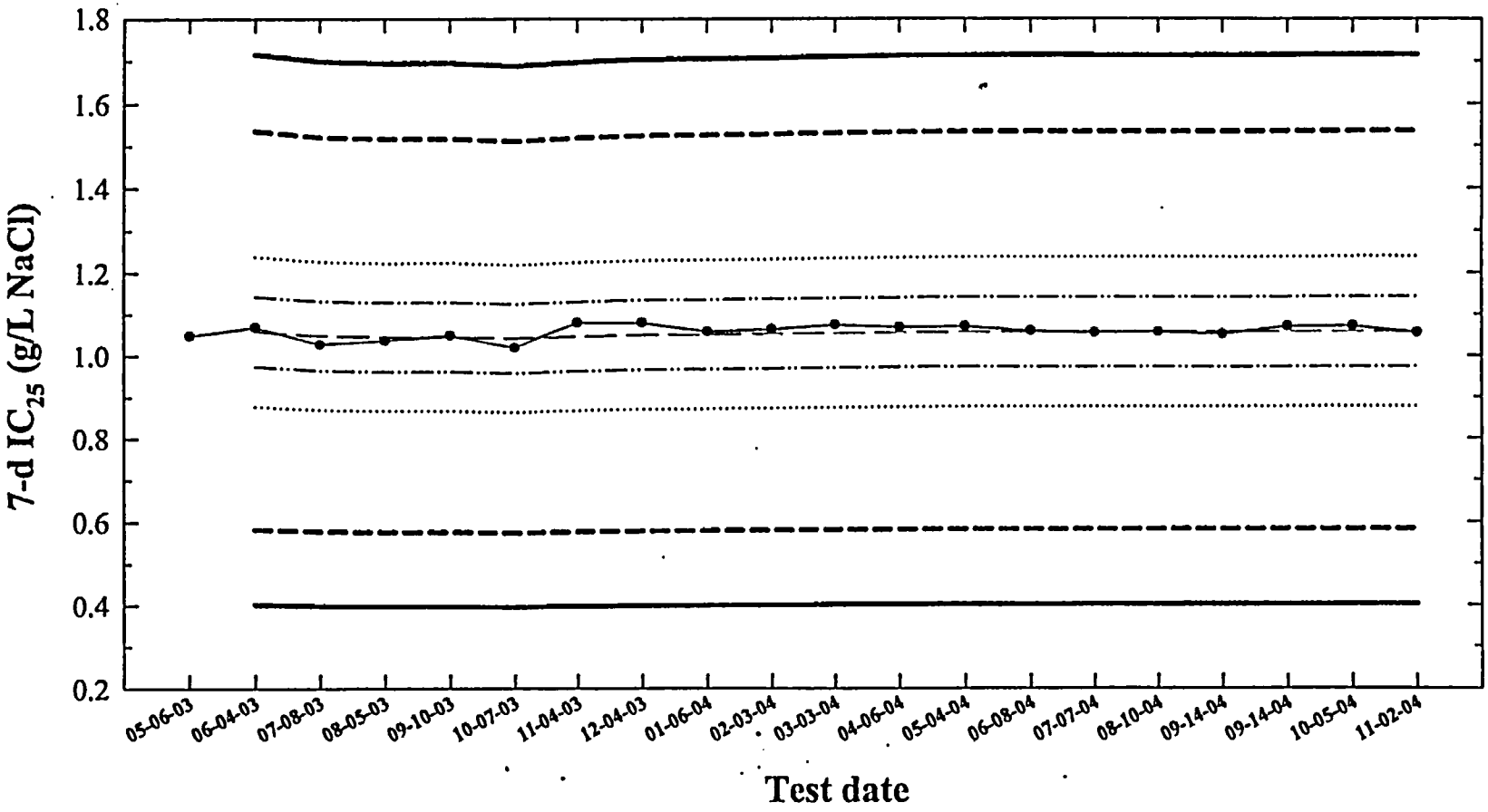
S_{A90} = Standard deviation corresponding to the 90th percentile CV. (S_{A90} = 0.62)

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	05-06-03	100	27.6		10.8		3.2	11.5	
2	06-04-03	100	25.9	26.8	5.9	8.4	2.6	10.1	10.8
3	07-08-03	100	29.0	27.5	11.6	9.4	3.2	10.9	10.8
4	08-05-03	100	33.3	29.0	6.6	8.7	4.7	14.1	11.6
5	09-10-03	100	29.3	29.0	4.3	7.8	3.1	10.7	11.5
6	10-07-03	100	33.4	29.8	8.0	7.9	3.2	9.5	11.1
7	11-04-03	100	31.0	29.9	7.3	7.8	2.6	8.3	10.7
8	12-04-03	100	30.4	30.0	9.7	8.0	3.6	11.8	10.8
9	01-06-04	100	30.6	30.1	4.4	7.6	3.5	11.5	10.9
10	02-03-04	100	30.7	30.1	7.2	7.6	2.7	8.8	10.7
11	03-03-04	100	29.0	30.0	7.8	7.6	3.0	10.3	10.7
12	04-06-04	100	28.1	29.9	6.2	7.5	2.8	10.0	10.6
13	05-04-04	100	32.5	30.1	6.4	7.4	3.3	10.1	10.6
14	06-08-04	100	32.9	30.3	6.8	7.4	3.0	9.0	10.5
15	07-07-04	100	33.3	30.5	6.3	7.3	2.6	7.8	10.3
16	08-10-04	100	27.4	30.3	5.8	7.2	2.3	8.6	10.2
17	09-14-04	100	28.7	30.2	4.9	7.1	2.4	8.2	10.1
18	09-14-04	100	28.8	30.1	7.5	7.1	3.0	10.5	10.1
19	10-05-04	100	29.6	30.1	8.2	7.1	2.8	9.6	10.1
20	11-02-04	100	30.5	30.1	8.5	7.2	2.7	8.8	10.0

Note:

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 7.2% 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 10.0% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

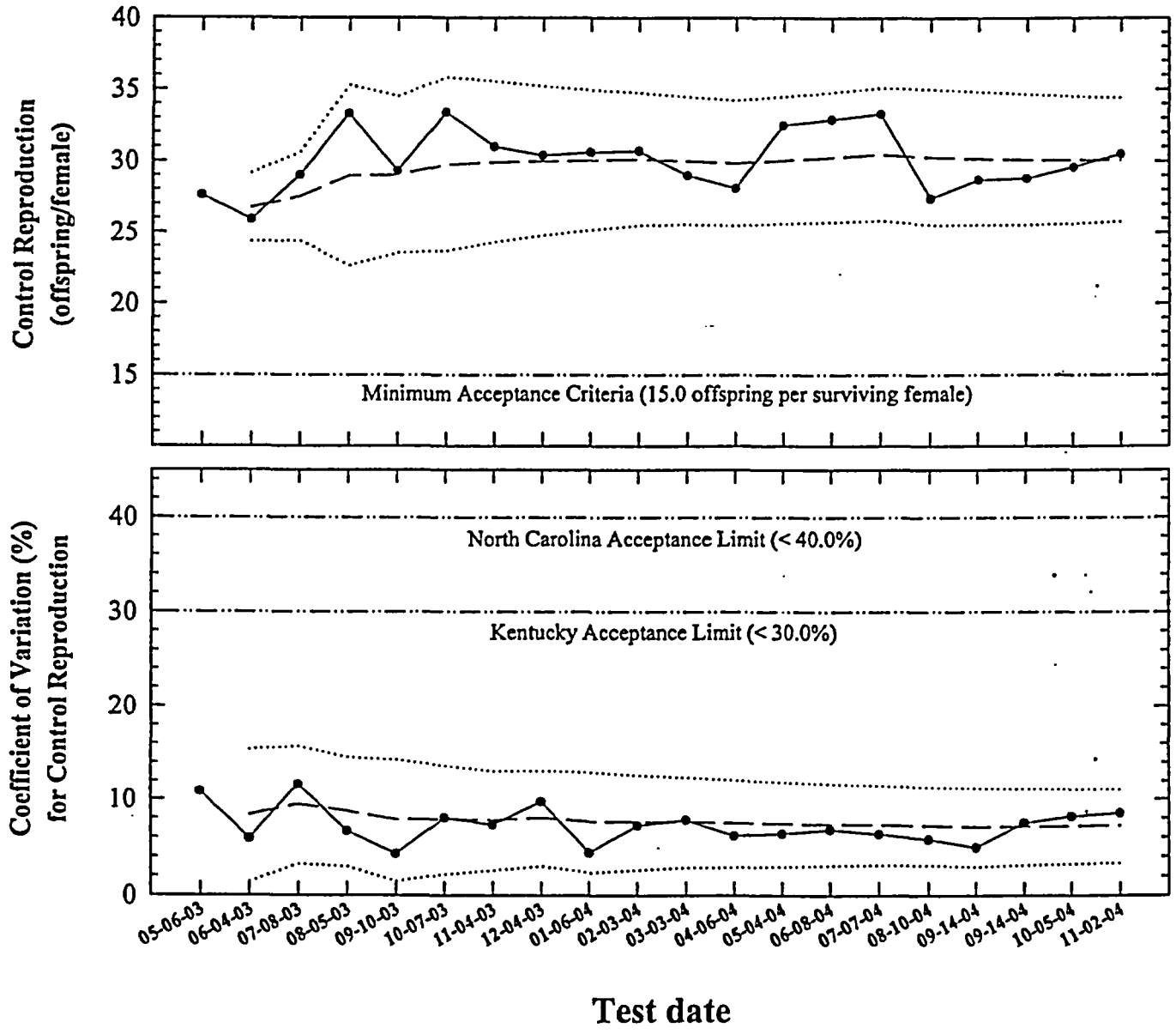
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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)**

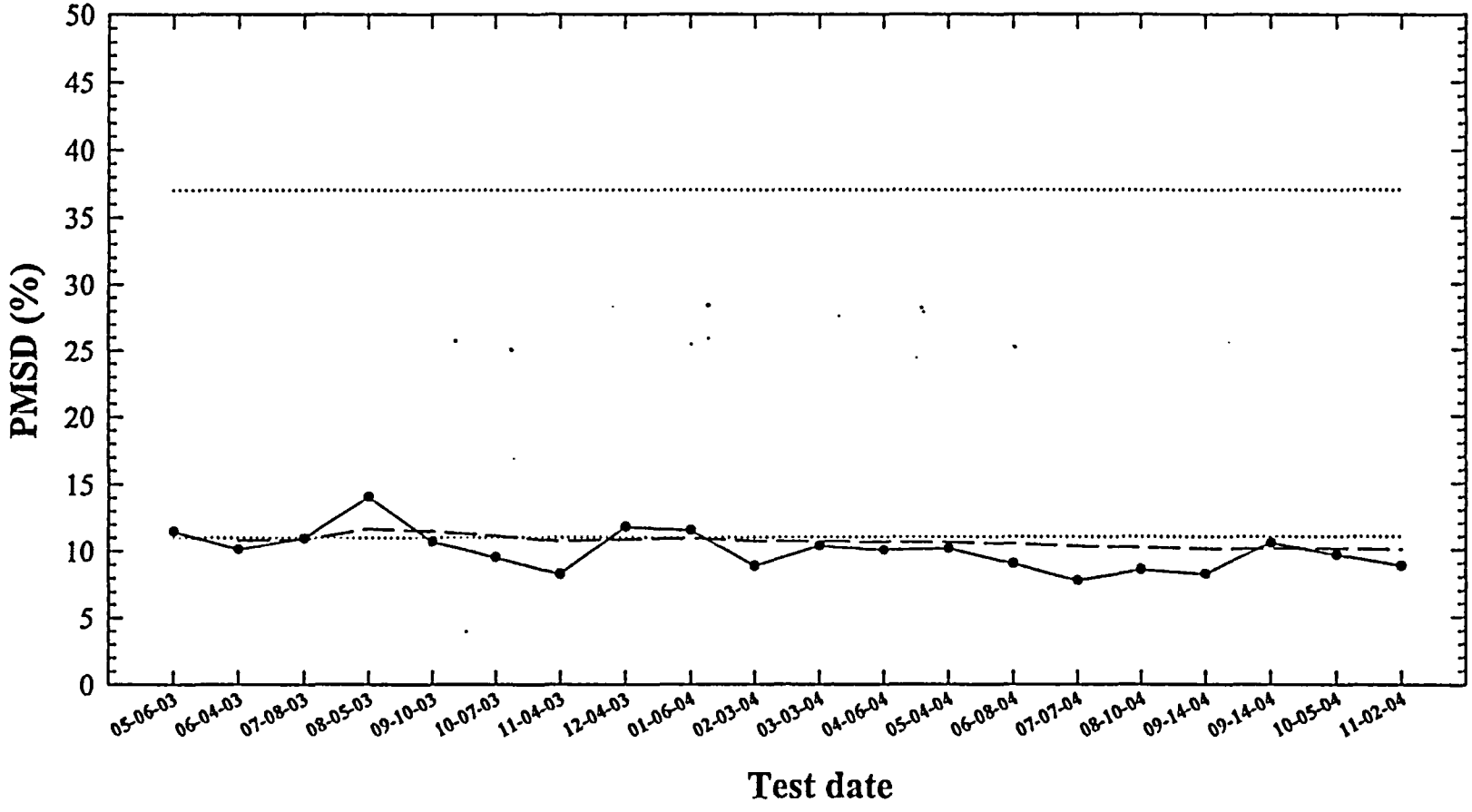
— — **Central Tendency** (mean Control Reproduction or CV)

····· **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 #: 29

Dilution preparation information:						*Comments:*
NaCl CHM number:		CHM120				
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:	PURPLE
Date and times organisms were born between:	11-02-04 0905 TO 1122	Incubator number and shelf location:	281
Organism source:	10-26-04 A-F	YCT batch: ~~ABS~~	10-05-04
Transfer bowl information:	pH = 7.91 SU Temperature = 24.9°C	*Selenastrum* batch: ~~ABS~~	10-25-04

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Analyst
0	11-02-04	1230	11-01-04	JJ
1	11-03-04	1142	11-01-04	KEK
2	11-04-04	1135	11-01-04	JJ
3	11-05-04	1136	11-01-04	JJ
4	11-06-04	1140	11-01-04	JJ
5	11-07-04	1152	11-01-04	KEK
6	11-08-04	1138	11-05-04	JJ
7	11-09-04	1133	[redacted]	JJ

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:	30.5	≥ 15.0 offspring/female	ChV	894.4
% CV:	8.5%	< 40.0 %	IC25	1055.3

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 29

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	5	4	4	4	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	10	11	10	12	11	9	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	16	14	16	15	13	18	14	18	16
Total young produced		31	31	28	31	29	29	~~32~~ 33	27	36	30
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:	30.5

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	4	4	4	4	4	3	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	9	10	12	11	0	11	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	16	14	18	17	14	15	15	16	14
Total young produced		32	30	27	32	33	29	29	30	32	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.3
% Reduction from Control:	0.7%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 29

800 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	4	4	5	5	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	10	0	11	11	0	0	0	13	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	12	0	0	11	9	12	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	13	14	19	16	15	15	17	15	13
Total young produced		33	27	30	34	31	31	29	33	32	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.8
% Reduction from Control:	-1.0%

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	3	4	4	4	4	4	4	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	8	10	10	0	11	0	9	12	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	7	0	12	0	0	*2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	14	16	16	13	12	14	10	15
Total young produced		28	26	28	30	27	28	28	26	26	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* SPLIT BROOD

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	27.6
% Reduction from Control:	9.5%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 29

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	4	4	3	4	2	4	2	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	4	0	1	4	3	3	0	7	5	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	3	0	0	0	0	3	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	3	3	2	0	6	3	0	8	4	6
Total young produced		9	9	7	8	12	10	5	19	11	16
Final Adult Mortality		L	L	L	L	L	L	D	L	L	L

Concentration:	
% Mortality:	10%
Mean Offspring/Female:	10.6
% Reduction from Control:	65.2%

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	3	3	1	0	3	2	0	2	1	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	4	0	0	0	0	0	2	1
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	1	4	0	0	0	1	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	2	3	0	3	1	1	0	2	0	0
Total young produced		6	10	5	3	4	4	0	4	3	3
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	4.2
% Reduction from Control:	86.2%

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	5	4	4	4	4	4	4	5	4	42
5	10	10	10	11	10	12	11	9	13	10	106
6	0	0	0	0	0	0	0	0	0	0	0
7	17	16	14	16	15	13	18	14	18	16	157
Total	31	31	28	31	29	29	33	27	36	30	305

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	3	4	4	4	4	4	4	3	4	4	38
5	11	8	10	10	0	11	0	9	12	8	79
6	0	0	0	0	7	0	12	0	0	2	21
7	14	14	14	16	16	13	12	14	10	15	138
Total	28	26	28	30	27	28	28	26	26	29	276

600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	3	5	40
5	11	10	9	10	12	11	0	11	13	10	97
6	0	0	0	0	0	0	10	0	0	0	10
7	17	16	14	18	17	14	15	15	16	14	156
Total	32	30	27	32	33	29	29	30	32	29	303

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	4	4	3	4	2	4	2	3	31
5	4	0	1	4	3	3	0	7	5	7	34
6	0	3	0	0	0	0	3	0	0	0	6
7	3	3	2	0	6	3	0	8	4	6	35
Total	9	9	7	8	12	10	5	19	11	16	106

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	4	5	5	4	4	4	43
5	12	10	0	11	11	0	0	0	13	11	68
6	0	0	12	0	0	11	9	12	0	0	44
7	16	13	14	19	16	15	15	17	15	13	153
Total	33	27	30	34	31	31	29	33	32	28	308

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	3	3	1	0	3	2	0	2	1	2	17
5	0	0	4	0	0	0	0	0	2	1	7
6	1	4	0	0	0	1	0	0	0	0	6
7	2	3	0	3	1	1	0	2	0	0	12
Total	6	10	5	3	4	4	0	4	3	3	42

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 #58 (#29 at 351 Depot St.)

Test dates: November 2-9, 2004

Reveiwed by:

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	31	31	28	31	29	29	33	27	36	30	100	30.5	8.5	Not applicable
600	32	30	27	32	33	29	29	30	32	29	100	30.3	6.2	0.7
800	33	27	30	34	31	31	29	33	32	28	100	30.8	7.5	-1.0
1000	28	26	28	30	27	28	28	26	26	29	100	27.6	4.9	9.5
1200	9	9	7	8	12	10	5	19	11	16	90	10.6	39.6	65.2
1400	6	10	5	3	4	4	0	4	3	3	100	4.2	61.3	86.2

Dunnett's MSD value: 2.693

PMSD: 8.8

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 *Ceriodaphnia* reproduction by 10.0% 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:	11/2/2004	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	11/9/2004	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	CHRONIC-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	31.000	28.000	31.000	29.000	29.000	33.000	27.000	36.000	30.000
600	32.000	30.000	27.000	32.000	33.000	29.000	29.000	30.000	32.000	29.000
800	33.000	27.000	30.000	34.000	31.000	31.000	29.000	33.000	32.000	28.000
1000	28.000	26.000	28.000	30.000	27.000	28.000	28.000	25.000	26.000	29.000
1200	9.000	9.000	7.000	8.000	12.000	10.000	5.000	19.000	11.000	16.000
1400	6.000	10.000	5.000	3.000	4.000	4.000	0.000	4.000	3.000	3.000

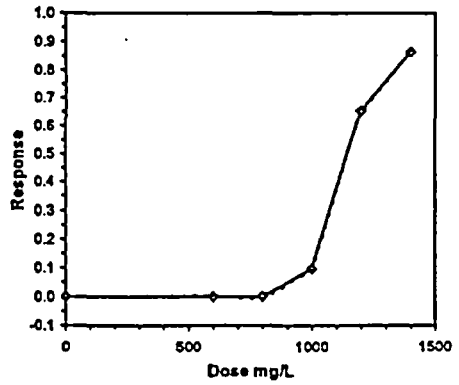
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	30.500	1.0000	30.500	27.000	36.000	8.501	10				30.533	1.0000
600	30.300	0.9934	30.300	27.000	33.000	6.233	10	0.170	2.287	2.693	30.533	1.0000
800	30.800	1.0098	30.800	27.000	34.000	7.467	10	-0.255	2.287	2.693	30.533	1.0000
*1000	27.600	0.9049	27.600	26.000	30.000	4.891	10	2.462	2.287	2.693	27.600	0.9039
*1200	10.600	0.3475	10.600	5.000	19.000	39.578	10	16.895	2.287	2.693	10.600	0.3472
*1400	4.200	0.1377	4.200	0.000	10.000	61.271	10	22.328	2.287	2.693	4.200	0.1376

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.9521032	1.035	0.78107399	1.6606005
Bartlett's Test indicates equal variances (p = 0.03)	12.2524052	15.0862722		

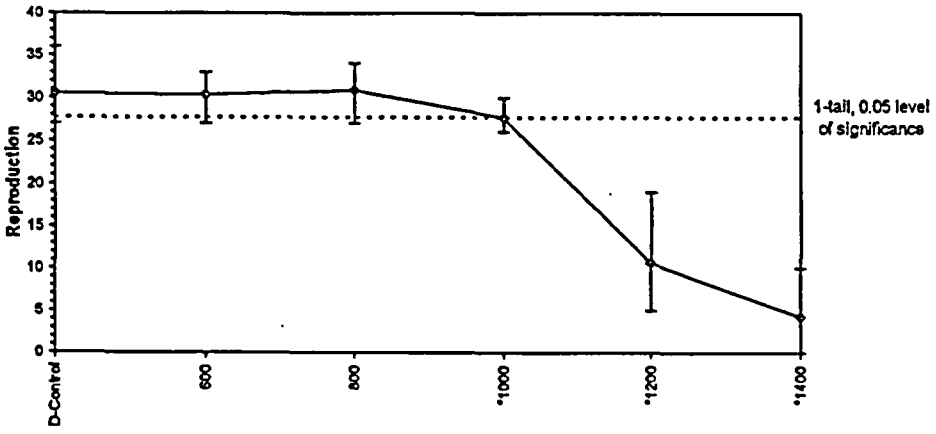
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		2.69342483	0.08830901	1392.14667	6.93703704	1.4E-33	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	904.090909	70.521427	714.476471	942.65625	-3.8589
IC10	1001.41176	29.4310854	903.551627	1011.38664	-1.6769
IC15	1019.37255	8.11342372	995.465195	1029.798	-1.3950
IC20	1037.33333	7.10725691	1018.79069	1049.32607	-0.3208
IC25	1055.29412	7.37316969	1039.31161	1068 45042	-0.0324
IC40	1109.17647	9.79468145	1093.36587	1127.94776	0.4878
IC50	1145.09804	12.192936	1126.10741	1170.73816	0.6180



Dose-Response Plot



Species: *Ceriodaphnia dubia*

CdNaCLCR #: 29

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	7.97	8.03	8.04	8.03	7.90	8.13
	DO (mg/L)	8.2	7.9	8.0	8.0	7.8	7.8
	Conductivity (µmhos/cm)	285		305		297	
	Alkalinity (mg $CaCO_3$/L)	62					
	Hardness (mg $CaCO_3$/L)	83					
	Temperature (°C)	24.6	25.3	24.9	25.0	24.7	25.1
600 mg NaCl/L	pH (S.U.)	7.97	7.98	8.03	7.99	8.03	8.09
	DO (mg/L)	8.1	7.9	8.1	8.0	7.9	7.9
	Conductivity (µmhos/cm)	1590		1560		1550	
	Temperature (°C)	24.7	25.5	24.8	25.0	24.7	25.1
800 mg NaCl/L	pH (S.U.)	7.97	7.98	8.03	7.98	8.05	8.08
	DO (mg/L)	8.1	7.8	8.1	8.0	7.9	8.0
	Conductivity (µmhos/cm)	1970		1970		1960	
	Temperature (°C)	24.5	25.1	24.7	24.9	24.7	25.3
1000 mg NaCl/L	pH (S.U.)	7.97	7.97	8.03	7.99	8.04	8.08
	DO (mg/L)	8.1	7.9	8.1	8.0	7.9	8.0
	Conductivity (µmhos/cm)	2390		2360		2340	
	Temperature (°C)	24.4	25.2	24.7	24.9	24.8	25.1
1200 mg NaCl/L	pH (S.U.)	7.97	7.96	8.02	7.96	8.04	8.07
	DO (mg/L)	8.1	8.0	8.2	8.0	7.9	8.0
	Conductivity (µmhos/cm)	2810		2800		2770	
	Temperature (°C)	24.6	25.2	24.9	24.9	24.7	25.0
1400 mg NaCl/L	pH (S.U.)	7.96	7.96	8.02	7.98	8.02	8.06
	DO (mg/L)	8.2	7.9	8.2	7.9	8.0	8.0
	Conductivity (µmhos/cm)	3190		3230		3120	
	Temperature (°C)	24.6	25.2	24.9	24.9	24.9	25.0
STOCK	Conductivity (µmhos/cm)	135000					
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 29

		Day							
		3		4		5		6	
	Analyst	CAJ	KBL	KBL	PCB	PCB	CAJ	CAJ	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	8.12	8.14	8.09	8.03	8.06	7.99	8.04	8.09	8.03
	DO (mg/L)	~~7.8~~ 7.9	8.3	7.8	7.7	7.8	7.9	7.8	7.8
	Conductivity (µmhos/cm)	300		300		295		303	
	Alkalinity (mg $CaCO_3$/L)							63	
	Hardness (mg $CaCO_3$/L)							89	
	Temperature (°C)	24.8	25.1	25.5	25.3	24.8	25.1	24.7	25.2
600 mg NaCl/L	pH (S.U.)	8.10	8.02	8.01	8.00	8.01	8.03	8.10	8.05
	DO (mg/L)	8.0	8.1	7.7	7.8	7.7	7.9	7.8	7.8
	Conductivity (µmhos/cm)	1450		1430		1250		1490	
	Temperature (°C)	24.9	25.1	25.3	25.0	24.9	25.1	24.8	25.2
800 mg NaCl/L	pH (S.U.)	8.09	8.00	8.02	7.99	8.03	8.02	8.11	8.05
	DO (mg/L)	8.0	8.0	7.9	7.8	7.7	8.0	7.9	7.8
	Conductivity (µmhos/cm)	1850		1830		1930		1820	
	Temperature (°C)	24.9	25.1	25.3	25.0	25.1	24.9	24.8	25.0
1000 mg NaCl/L	pH (S.U.)	8.10	7.98	8.01	7.98	8.02	8.02	8.11	8.06
	DO (mg/L)	8.1	8.0	7.7	7.8	7.8	8.0	7.9	7.8
	Conductivity (µmhos/cm)	2230		2200		2370		2300	
	Temperature (°C)	24.7	24.9	25.2	24.9	24.8	25.1	24.8	25.3
1200 mg NaCl/L	pH (S.U.)	8.09	7.98	8.01	7.97	8.02	8.02	8.11	8.04
	DO (mg/L)	8.1	8.0	8.0	7.7	7.8	8.0	7.9	7.8
	Conductivity (µmhos/cm)	2680		2590		2830		2710	
	Temperature (°C)	24.7	24.9	25.4	25.2	24.9	25.2	24.9	25.1
1400 mg NaCl/L	pH (S.U.)	8.08	7.97	8.01	7.99	8.01	8.03	8.10	8.06
	DO (mg/L)	8.0	8.1	8.2	7.7	7.9	8.0	8.0	7.9
	Conductivity (µmhos/cm)	3070		2980		3210		3150	
	Temperature (°C)	24.9	25.2	25.2	24.9	24.8	25.0	24.8	25.2
STOCK	Conductivity (µmhos/cm)								
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

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

ATTN: Stephanie A. Howard

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

PERMIT NUMBER	DISCHARGE NUMBER
TN0026450	103 G

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	04	11	01	To	04	11	30

MAJOR
(SUBR 01)
F - FINAL
LOW VOL. WASTE TREATMENT POND
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
PH	SAMPLE MEASUREMENT	********	********	**	7.1	********	8.7	12	0	18 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	89	132	26	********	7	12	19	0	9 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<71	<113	26	********	<5	<5	19	0	9 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.375	2.696	03	********	********	********	**	0	30 / 30	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		DAILY	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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)*

The Turbine Building Sump was discharged directly to the Yard Drainage Pond on November 1 and 4-7, 2004.

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	04	11	01	To	04	11	30

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	********	********	**	7.9	********	8.1	12	0	3 / 30	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	********	********	**	********	********	3	19	0	3 / 30	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	3 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********	0.002	19	0	3 / 30	COMPOS
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********	0.11	19	0	3 / 30	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	0.032	0.033	03	********	********	********	**	0	3 / 30	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		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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)*

The Lined Metal Pond was discharged directly to the LVWTP (Outfall 103) on November 1-3, 2004. 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	04	11	01	To	04	11	30

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		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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 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	04	11	01	To	04	11	30

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 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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)*

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	04	11	01	To	04	11	30

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 / 30	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 30	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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)*

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	04	11	01	To	04	11	30

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet 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 Principal Environmental Engineer	423	843-6700	04	12	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)*

During this reporting period, there has been no flow from the Dredge Pond other than that resulting from rainfall.