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

March 14, 2005

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 FEBRUARY 2005

Enclosed is the February 2005 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	05	02	01	To	05	02	28

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	10.3	04	0	28 / 28	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	********	********	**	********	********	24.6	04	0	28 / 28	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.6	********	7.8	12	0	8 / 28	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	4	6	19	0	4 / 28	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 / 28	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	********	1489	03	********	********	********	**	0	28 / 28	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.011	0.022	19	0	28 / 28	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 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	05	03	11
TYPED OR PRINTED			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 0.028mg/L--limit 0.100mg/L) 2. Biodetergent 73551 (max. calc. conc. was 0.007mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.010mg/L--limit 0.100mg/L)

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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	05	02	01	To	05	02	28

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	********	********	**	********	********	0.4	62	0	28 / 28	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	********	********	**	********	********	2.3	04	0	28 / 28	CALCTD
00016 1 W 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0	DEG. C.		CONTIN UOUS	CALCTD
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.20	<0.25	0.30	19	0	2 / 28	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	05	03	11
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 February 2005 is attached.

CCW TRENCH

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
02/08/2005 0905	< 0.5 mg/L	02/11/2005 1930	CVS	EPA 8015B

CCW CHANNEL

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
02/08/2005 0910	< 0.5 mg/L	02/11/2005 1852	CVS	EPA 8015B

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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	05	02	01	To	05	02	28

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			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 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	05	03	11
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled February 6-11, 2005. Report is attached.

March 8, 2005

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, OUTFALL 101, FEBRUARY, 2005

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 February 6-11, 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 was not sufficient to jeopardize statistical validity, although survival was improved in UV treated samples.

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
CTR 2L-M

Attachment
cc (Attachment):
Files, R&TA, CTR 1B-M

SQN February 2005M

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: March 8, 2005

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): 3.266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: February 6-11, 2005
10. Average Flow on Days Sampled (MGD): 1477, 1477, 1475
11. Pertinent Site Conditions: H-130M molluscicide was not injected from February 6-11, 2005.
12. Test Dates: February 8-15, 2005
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 February 6-11, 2005, 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, mortality which occurred in minnows exposed to routine compliance samples was not sufficient to jeopardize statistical validity, although survival was improved in UV treated samples.

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	02/06/05 0932 to 02/07/05 0832	02/07/05 1350	0.9†	<0.10	02/08/05 1348 02/09/05 1318
Intake	02/06/05 1050 to 02/07/05 0950	02/07/05 1350	1.3	<0.10	02/08/05 1348 02/09/05 1318
101	02/08/05 0759 to 02/09/05 0659	02/09/05 1343	2.9, 17†	<0.10	02/10/05 1329 02/11/05 1321
Intake	02/08/05 0822 to 02/09/05 0722	02/09/05 1343	1.3	<0.10	02/10/05 1329 02/11/05 1321
101	02/10/05 0858 to 02/11/05 0758	02/11/05 1313	3.4, 3.1†	<0.10	02/12/05 1258 02/13/05 1254 02/14/05 1302
Intake	02/10/05 0844 to 02/11/05 0744	02/11/05 1313	0.8	<0.10	02/12/05 1258 02/13/05 1254 02/14/05 1302

*TRC = Total Residual Chlorine
†Samples were collected in two 2.5 gallon cubitainers. Temperature was measured in each cubitainer 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.

Test Organisms:	*Pimephales promelas*	*Ceriodaphnia dubia*
1. Source:	Aquatic BioSystems, Inc.	In-house Cultures
2. Age:	21.75-24.75 hours old	<24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	02/08/05 - 1348 ET	02/08/05 - 1116 ET
UV Treated Outfall 101	02/08/05 - 1330 ET	
7. Test Termination: (Date/Time)		
Outfall 101	02/15/05 - 1300 ET	02/15/05 - 1118 ET
UV Treated Outfall 101	02/15/05 - 1241 ET	
8. Test Temperature: Outfall 101:	Mean = 24.8C (24.3 - 25.4°C)	Mean = 24.8°C (24.3 - 25.3°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.8°C (24.1 - 25.5°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 February 8 -15, 2005 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	98	98	98
22.0%	100	100	100	100	100	98	98
43.9%	100	100	100	100	100	100	100
72.0%	100	100	93	88	88	83	80
100.0%	100	100	100	98	95	93	93
Intake	100	100	100	100	100	100	98

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.646	0.607	0.631	0.697	0.645
10.98%	0.620	0.616	0.686	0.692	0.654
22.0%	0.618	0.653	0.748	0.664	0.671
43.9%	0.709	0.621	0.640	0.626	0.649
72.0%	0.718	0.586	0.195	0.681	0.545
100.0%	0.581	0.438	0.598	0.664	0.570
Intake	0.645	0.590	0.706	0.654	0.649

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 February 8-15, 2005 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	29	30	27	30	28	34	32	31	30	30	30.1
10.98%	31	36	32	29	32	31	34	34	31	27	31.7
22.0%	32	35	33	35	32	32	31	32	30	28	32.0
43.9%	32	36	36	34	34	37	34	34	31	37	34.5
72.0%	33	37	36	31	32	36	37	33	36	35	34.6
100.0%	35	35	38	35	34	38	35	37	37	34	35.8

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 February 8-15, 2005 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	31	28	30	30	29	30	26	31	32	29	29.6
Intake	31	32	34	34	32	33	32	31	33	35	32.7

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 February 8-15, 2005 using effluent from UV Treated Outfall 101.

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

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.632	0.738	0.699	0.711	0.695
10.98%	0.738	0.743	0.710	0.585	0.694
22.0%	0.659	0.647	0.698	0.700	0.676
43.9%	0.627	0.706	0.698	0.673	0.676
72.0%	0.577	0.692	0.567	0.622	0.615
100.0%	0.719	0.575	0.547	0.706	0.637
Intake	0.634	0.707	0.624	0.675	0.660

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	February 8-15, 2005	1441	7-days	KCl	0.62 g/L
Ceriodaphnia dubia	February 8-15, 2005	1103	7-days	NaCl	1.05 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, February 8-15, 2005.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	25.1 24.9 - 25.3	24.6 24.5 - 24.8	7.8 7.7 - 7.8	7.5 7.1 - 7.7	7.88 7.72 - 8.11	7.59 7.39 - 7.85	295 282 - 308	61 58 - 64	84 81 - 86	
	10.98%	25.1 24.8 - 25.2	24.5 24.3 - 24.6	7.9 7.7 - 8.1	7.5 7.2 - 7.7	7.87 7.61 - 8.22	7.58 7.41 - 7.85	284 271 - 304			
	22.0%	25.1 24.8 - 25.3	24.6 24.3 - 24.8	7.9 7.7 - 8.2	7.4 7.2 - 7.6	7.87 7.62 - 8.21	7.58 7.42 - 7.84	277 265 - 298			
	43.9%	25.2 24.8 - 25.4	24.6 24.4 - 24.8	7.9 7.7 - 8.2	7.4 7.1 - 7.6	7.87 7.61 - 8.23	7.59 7.42 - 7.87	254 240 - 288			
	72.0%	25.1 24.9 - 25.3	24.5 24.3 - 24.7	7.9 7.7 - 8.3	7.4 7.1 - 7.6	7.85 7.57 - 8.23	7.61 7.46 - 7.85	218 205 - 255			
	100.0%	25.2 25.1 - 25.4	24.5 24.3 - 24.8	7.9 7.7 - 8.3	7.5 7.0 - 7.6	7.86 7.59 - 8.25	7.64 7.48 - 7.91	187 174 - 225	67 66 - 68	80 78 - 82	<0.10 <0.10 - <0.10
	Intake	25.1 25.0 - 25.3	24.5 24.4 - 24.7	7.9 7.7 - 8.3	7.4 7.1 - 7.7	7.86 7.61 - 8.27	7.62 7.49 - 7.87	189 173 - 223	67 66 - 68	79 78 - 80	<0.10 <0.10 - <0.10
Ceriodaphnia dubia	Control	25.0 24.7 - 25.3	24.6 24.4 - 24.9	7.8 7.7 - 7.8	7.7 7.4 - 8.0	7.88 7.72 - 8.11	7.76 7.57 - 8.13	295 282 - 308	61 58 - 64	84 81 - 86	
	10.98%	25.0 24.7 - 25.2	24.7 24.5 - 25.1	7.9 7.7 - 8.1	7.8 7.4 - 8.1	7.87 7.61 - 8.22	7.76 7.59 - 8.12	284 271 - 304			
	22.0%	25.0 24.7 - 25.1	24.6 24.4 - 25.1	7.9 7.7 - 8.2	7.8 7.5 - 8.1	7.87 7.62 - 8.21	7.76 7.58 - 8.11	277 265 - 298			
	43.9%	25.0 24.6 - 25.1	24.7 24.4 - 25.0	7.9 7.7 - 8.2	7.8 7.3 - 8.1	7.87 7.61 - 8.23	7.77 7.59 - 8.12	254 240 - 288			
	72.0%	25.1 24.7 - 25.3	24.7 24.3 - 25.2	7.9 7.7 - 8.3	7.8 7.4 - 8.1	7.85 7.57 - 8.23	7.77 7.59 - 8.14	218 205 - 255			
	100.0%	25.0 24.5 - 25.3	24.6 24.3 - 24.9	7.9 7.7 - 8.3	7.8 7.3 - 8.2	7.86 7.59 - 8.25	7.79 7.59 - 8.17	187 174 - 225	67 66 - 68	80 78 - 82	<0.10 <0.10 - <0.10
	Intake	25.0 24.6 - 25.3	24.6 24.4 - 24.9	7.9 7.7 - 8.3	7.9 7.5 - 8.2	7.86 7.61 - 8.27	7.80 7.58 - 8.15	189 173 - 223	67 66 - 68	79 78 - 80	<0.10 <0.10 - <0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.8	24.3	25.4
Ceriodaphnia dubia	24.8	24.3	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, February 8-15, 2005.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)
Pimephales promelas	Control	25.0 24.8 - 25.2	24.5 24.4 - 24.6	7.9 7.8 - 8.3	7.5 7.2 - 7.7	7.85 7.70 - 8.20	7.58 7.40 - 7.79	296 278 - 341
	10.98%	25.1 24.8 - 25.4	24.5 24.3 - 24.7	8.0 7.8 - 8.4	7.5 7.1 - 7.8	7.85 7.68 - 8.20	7.57 7.41 - 7.79	288 272 - 326
	22.0%	25.2 24.9 - 25.3	24.5 24.3 - 24.7	8.0 7.8 - 8.5	7.4 7.1 - 7.6	7.85 7.69 - 8.20	7.58 7.39 - 7.82	278 265 - 306
	43.9%	25.1 24.9 - 25.4	24.5 24.1 - 24.8	8.0 7.8 - 8.5	7.5 7.1 - 7.7	7.86 7.68 - 8.21	7.56 7.38 - 7.80	252 237 - 289
	72.0%	25.1 24.7 - 25.4	24.5 24.3 - 24.8	8.0 7.8 - 8.5	7.5 7.2 - 7.8	7.85 7.67 - 8.21	7.63 7.47 - 7.84	219 205 - 255
	100.0%	25.2 24.9 - 25.5	24.5 24.3 - 24.8	8.0 7.7 - 8.3	7.5 7.2 - 7.8	7.85 7.66 - 8.21	7.61 7.45 - 7.84	188 170 - 211
	Intake	25.1 25.0 - 25.3	24.5 24.3 - 24.8	8.1 7.9 - 8.3	7.6 7.3 - 8.1	7.86 7.66 - 8.21	7.60 7.39 - 7.88	188 174 - 215

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.8	24.1	25.5

SUMMARY / CONCLUSIONS

Outfall 101 samples collected February 6-11, 2005, 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, mortality which occurred in minnows exposed to routine compliance samples was not sufficient to jeopardize statistical validity, although survival was improved in UV treated samples.

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 g/L KCl or NaCl.

2. Standard Toxicant: Potassium Chloride (KCl crystalline) for *Pimephales promelas.*
   Sodium Chloride (NaCl crystalline) for *Ceriodaphnia dubia.*

3. Dilution Water Used: Moderately hard synthetic water.

4. Statistics: ToxCalc software Version 5.0 was used for statistical analyses.

REFERENCES

1. NPDES Permit No. 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
February 8 - 15, 2005

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 - February 11, 2005

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 - February 11, 2005

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 - February 11, 2005

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 - February 11, 2005

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 - February 11, 2005

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	Nalco 73551 mg/L EO/PO
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	-
02/06/2005		<0.0042	0.028	0.010		-		-
02/07/2005		<0.0116	0.028	0.010		-		0.007
02/08/2005		<0.0080	0.028	0.010		-		-
02/09/2005		0.0199	0.028	0.010		-		-
02/10/2005		<0.0042	0.028	0.010		-		-
02/11/2005		0.0155	0.028	0.010		-		0.007
						-		
						-		
						-		
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Sequoyah Nuclear Plant Biomonitoring
February 8 - 15, 2005

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.
JFumse

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 1084 Laboratory Use				
		Date	Time			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	2/06/05-2/07/05	0932/0832	2 (2.5gal)	NA			✓		050207.02	0.9°C	JS	1350	* see comments
SQN-INT-TOX	Comp	2/06/05-2/07/05	~~10~~/1050 0950	1 (2.5 gal)	NA			✓		050207.03	1.3°C	JS	1350	↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	02/07/2005 1015	Express Courier Dancey Woody #341	02/07/2005 10:15
Express Courier Dancey Woody #341	02/07/2005 1:50	ETS JFumse	02/07/2005 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.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
02-07-05	1341	K .Keenan	Hill's Speedy Delivery	0.8	1683	050207.01	Waynesville WWTP	TN	
02-07-05	1350	J. Sumner	Express Courier	0.9	1684	050207.02	TVA - Sequoyah Nuclear Plant - 101	TN	
02-07-05	1350	J. Sumner	Express Courier	1.3	1684	050207.03	TVA - Sequoyah Nuclear Plant - INT		

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

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 1604 Laboratory Use				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	2/8/05-2/9/05	0754/0659	2 (2.5gal)	NA			✓		050209.22	2.9 / 1.7	1343	KER	See COMMENTS
SQN-INT-TOX	Comp	2/8/05-2/9/05	0822/0722	1 (2.5 gal)	NA			✓		050209.23	1.3	1343	KER	↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	2/9/2005 0920	Express Courier L. Ro. Harrington Jr.	2/9/2005 0920
Express Courier L. Ro. Harrington Jr.	2/9/2005 1343	ETS K. E. Kennan ETS	2/9/2005 1343

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.

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
02-09-05	0707	K. Keenan	Greyhound	0.3	1692	050209.01	Bell Enterprises - Scarlett Acres MHP	NC	
02-09-05	0931	K. Keenan	Wilson Trucking	0.7	1693	050209.02	Tritest, Inc. - Johnston County Regional WWTP	NC	
02-09-05	0931	K. Keenan	Wilson Trucking	0.7	1694	050209.03	Tritest, Inc. - South Cary WWTP	NC	
02-09-05	0931	K. Keenan	Wilson Trucking	0.7	1695	050209.04	Tritest, Inc. - Wake Forest WWTP	NC	
02-09-05	0931	K. Keenan	Wilson Trucking	0.7	1696	050209.05	Tritest, Inc. - Wilson WWTP	NC	
02-09-05	0931	K. Keenan	Wilson Trucking	0.7	1697	050209.06	Tritest, Inc. - Raleigh - Neuse WWTP	NC	
02-09-05	0943	K. Keenan	Fed - Ex	0.3	1698	050209.07	Duke Energy Corporation - Marshall Steam Station	NC	
02-09-05	1012	K. Keenan	UPS	0.4	1699	050209.08	Tritest, Inc. - Apex WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.4	1700	050209.09	Tritest, Inc. - Dynea	NC	
02-09-05	1012	K. Keenan	UPS	0.4	1701	050209.10	Tritest, Inc. - Ellerbe WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.5	1702	050209.11	Oxford Laboratories, Inc. - Bladenboro WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.5	1703	050209.12	Oxford Laboratories, Inc. - Enfield WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.5	1704	050209.13	Oxford Laboratories, Inc. - Scotland Neck WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.5	1705	050209.14	Oxford Laboratories, Inc. - BASF	NC	
02-09-05	1012	K. Keenan	UPS	0.5	1706	050209.15	Oxford Laboratories, Inc. - Morehead City WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.6	1707	050209.16	Microbac Environmental Laboratory - Rockingham WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.6	1708	050209.17	Microbac Environmental Laboratory - Roseboro WWTP	NC	
02-09-05	1012	K. Keenan	UPS	0.6	1709	050209.18	Microbac Environmental Laboratory - J. P. Stevens - Wagram	NC	
02-09-05	1130	K. Keenan	Fed - Ex	1.8	1710	050209.19	Elements Chromium	NC	
02-09-05	1217	C. Jobe	A + Delivery	0.6	1687	050209.20	OWASA Mason Farms	NC	
02-09-05	1233	K. Keenan	Hill's Speedy Delivery	1.0	1683	050209.21	Waynesville WWTP	NC	
02-09-05	1343	K. Keenan	Express Courier	2.9/1.7	1684	050209.22	TVA - Sequoyah Nuclear Plant - 101	TN	
02-09-05	1343	K. Keenan	Express Courier	1.3	1684	050209.23	TVA - Sequoyah Nuclear Plant - Intake	TN	

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:
* Custody seals intact. Samples received in good condition.
JSumner

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 1684 Laboratory Use				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	2/10/05-2/11/05	0858/0758	2 (2.5gal)	NA			✓		0502111.03	3.4/3.1	JS	1313	*see COMMENTS
SQN-INT-TOX	Comp	2/10/05-2/11/05 0844/0744	0844/0744	1 (2.5 gal)	NA			✓		0502111.04	0.8	JS	1313	↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	2/11/2005 0845	Express Courier L. A. Hunnicutt	2/11/2005 0845
Express Courier L. A. Hunnicutt	2/11/2005 1313	ETS JSumner	2/11/2005 1313

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.

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
02-11-05	1238	K. Keenan	Hill's Speedy Delivery	1.5	1683	050211.01	Waynesville WWTP - Pp	NC	
02-11-05	1238	K. Keenan	Hill's Speedy Delivery	1.5	1689	050211.02	Waynesville WWTP - Cd	NC	
02-11-05	1313	J. Sumner	Express Courier	3.4/3.1	1684	050211.03	TVA - Sequoyah Nuclear Plant - 101	TN	
02-11-05	1313	J. Sumner	Express Courier	0.8	1684	050211.04	TVA - Sequoyah Nuclear Plant - Intake	TN	
02-11-05	1331	K. Keenan	Asheville Courier	0.3	1690	050211.05	Comm - Scope, Inc.	NC	

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 1684

County: Hamilton
Treatment: Non-treated
Outfall: 101

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 24.75-HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	02-07-05 1300 TO 1600	Incubator number:	3C
Organism source:	ABS BATCH 02-07-05	*Artemia* lot number:	BG 10055
Transfer bowl information:	pH = 7.62 Temperature = 24.3 °C	Total drying time:	24-HOURS
		Date / Time in: 02-15-05	1415
Average transfer volume:	9.5 mL	Date / Time out: 02-16-05	1420
		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	02-08-05	——	1450	1348	02-06-05	050207.02+.03	JH
1	02-09-05	0932	1530	1318	02-06-05	050207.02+.03	JH
2	02-10-05	0930	1534	1329	02-07-05	050209.22+.23	JH
3	02-11-05	0925 ~~0935~~	1530	1321	02-07-05	050209.22+.23	JH
4	02-12-05	0920	1533	1258	02-10-05 B	050211.03+.04	KEK
5	02-13-05	0930	1533	1254	02-10-05 B	050211.03+.04	KEK
6	02-14-05	0921	1600	1302	02-12-05	050211.03+.04	KEK
7	02-15-05			1300			JH

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	> 100%
Average weight per initial larvae:	0.645		NOEC	100%
Average weight per surviving larvae:	0.645	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC_{25}	> 100%

Species: *Pimephales promelas* **Date:** 02-08-05

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	10	10	9 1d FG	10	10	10	10	10	10
6	10	10	10	10	10	9	10	10	9 1d FG	10	10	10
7	10	10	10	10	10	9	10	10	9	10	10 LG	10
A = Pan weight (mg) Color identification: Purple Beaker Analyst: PCB	14.63	14.71	14.69	14.65	14.73	14.71	14.53	14.53	14.47	14.57	14.63	14.62
B = Pan + Larvae weight (mg) Analyst: dl	21.09	20.78	21.00	21.62	20.93	20.87	21.39	21.45	20.65	21.10	22.11	21.26
Larvae weight (mg) = A – B	6.46	6.07	6.31	6.97	6.20	6.16	6.86	6.92	6.18	6.53	7.48	6.64
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.646	0.607	0.631	0.697	0.620	0.616	0.686	0.692	0.618	0.653	0.748	0.664
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.645				0.654		-1.3%		0.671		-4.0%	

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: 1 MINNOWS THAT DIED IN THE EFFLUENT CONCENTRATIONS WERE HEAVILY FUNGUSED. dl

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 02-08-05

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	7 3d SG	10	10	10	10	10
4	10	10	10	10	10	10	5 2d SG FG	10	10	9 1d FG	10	10
5	10	10	10	10	10	10	5	10	10	8 1d FG	10	10
6	10	10	10	10	10	10	3 2d FG	10	9 1d FG	8	10	10
7	lg 10	10	10	10	lg 10	9 1d FG	3	10	9	sm 8	sm 10	10
A = Pan weight (mg) Color identification: Purple Beaker Analyst: PCB	14.50	14.64	14.54	14.67	14.68	14.63	14.65	14.63	14.65	14.49	14.64	14.60
B = Pan + Larvae weight (mg) Analyst: JS	21.59	20.85	20.94	20.93	21.86	20.49	16.60	21.44	20.46	18.87	20.62	21.24
Larvae weight (mg) = A – B	7.09	6.21	6.40	6.26	7.18	5.86	1.95	6.81	5.81	4.38	5.98	6.64
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.709	0.621	0.640	0.626	0.718	0.586	0.195	0.681	0.581	0.438	0.598	0.664
Average weight per initial number of larvae (mg)	0.649				0.545				0.570			
Percent reduction from control (%)			-0.6%				15.5%				11.6%	

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:** 02-08-05

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	9 1d FG	10 1LG	10
A = Pan weight (mg) Pie Color identification: Beaker Analyst: PCB	14.61	14.66	14.58	14.59
B = Pan + Larvae weight (mg) Analyst: JA	21.06	20.56	21.64	21.13
Larvae weight (mg) = A – B	6.45	5.90	7.06	6.54
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.645	0.590	0.706	0.654
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.649		- 0.5%	

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: JA

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: February 8-15, 2005
Project number: 1684

Reviewed by: J Lunsford

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	14.63	21.09	6.46	0.646	0.645	5.9	0.646	100.0	0.645	5.9	Not applicable
	B	10	10	14.71	20.78	6.07	0.607			0.607				
	C	10	10	14.69	21.00	6.31	0.631			0.631				
	D	10	10	14.65	21.62	6.97	0.697			0.697				
10.98%	E	10	10	14.73	20.93	6.20	0.620	0.671	5.1	0.620	97.5	0.654	6.3	-1.3
	F	10	9	14.71	20.87	6.16	0.684			0.616				
	G	10	10	14.53	21.39	6.86	0.686			0.686				
	H	10	10	14.53	21.45	6.92	0.692			0.692				
22%	I	10	9	14.47	20.65	6.18	0.687	0.688	6.2	0.618	97.5	0.671	8.2	-4.0
	J	10	10	14.57	21.10	6.53	0.653			0.653				
	K	10	10	14.63	22.11	7.48	0.748			0.748				
	L	10	10	14.62	21.26	6.64	0.664			0.664				
43.9%	M	10	10	14.50	21.59	7.09	0.709	0.649	6.3	0.709	100.0	0.649	6.3	-0.6
	N	10	10	14.64	20.85	6.21	0.621			0.621				
	O	10	10	14.54	20.94	6.40	0.640			0.640				
	P	10	10	14.67	20.93	6.26	0.626			0.626				
72%	Q	10	10	14.68	21.86	7.18	0.718	0.675	4.7	0.718	80.0	0.545	44.0	15.5
	R	10	9	14.63	20.49	5.86	0.651			0.586				
	S	10	3	14.65	16.60	1.95	0.650			0.195				
	T	10	10	14.63	21.44	6.81	0.681			0.681				
100%	U	10	9	14.65	20.46	5.81	0.646	0.614	8.5	0.581	92.5	0.570	16.7	11.6
	V	10	8	14.49	18.87	4.38	0.548			0.438				
	W	10	10	14.64	20.62	5.98	0.598			0.598				
	X	10	10	14.60	21.24	6.64	0.664			0.664				
100% Intake	Y	10	10	14.61	21.06	6.45	0.645	0.665	4.2	0.645	97.5	0.649	7.3	-0.5
	Z	10	9	14.66	20.56	5.90	0.656			0.590				
	AA	10	10	14.58	21.64	7.06	0.706			0.706				
	BB	10	10	14.59	21.13	6.54	0.654			0.654				

Outfall 101:
Dunnett's MSD value: 0.1898
PMSD: 29.4

Intake:
Dunnett's MSD value: 0.0591
PMSD: 9.2

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.7% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/8/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101
End Date:	2/15/2005	Lab ID:	RTS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	0.6460	0.6070	0.6310	0.6970
10.98	0.6200	0.6160	0.6860	0.6920
22	0.6180	0.6530	0.7480	0.6640
43.9	0.7090	0.6210	0.6400	0.6260
72	0.7180	0.5860	0.1950	0.6810
100	0.5810	0.4380	0.5980	0.6640

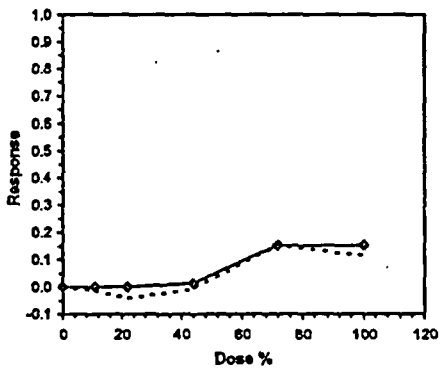
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	0.6453	1.0000	0.6453	0.6070	0.6970	5.898	4			0.6565	1.0000
10.98	0.6535	1.0128	0.6535	0.6160	0.6920	6.289	4	18.00	10.00	0.6565	1.0000
22	0.6708	1.0395	0.6708	0.6180	0.7480	8.216	4	21.00	10.00	0.6565	1.0000
43.9	0.6490	1.0058	0.6490	0.6210	0.7090	6.287	4	18.00	10.00	0.6490	0.9886
72	0.5450	0.8446	0.5450	0.1950	0.7180	44.012	4	17.00	10.00	0.5576	0.8494
100	0.5703	0.8838	0.5703	0.4380	0.6640	16.687	4	13.00	10.00	0.5576	0.8494

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.837063551	0.884	-1.78553777	6.572470301
Bartlett's Test indicates unequal variances (p = 4.83E-03)	16.83168411	15.08627224		

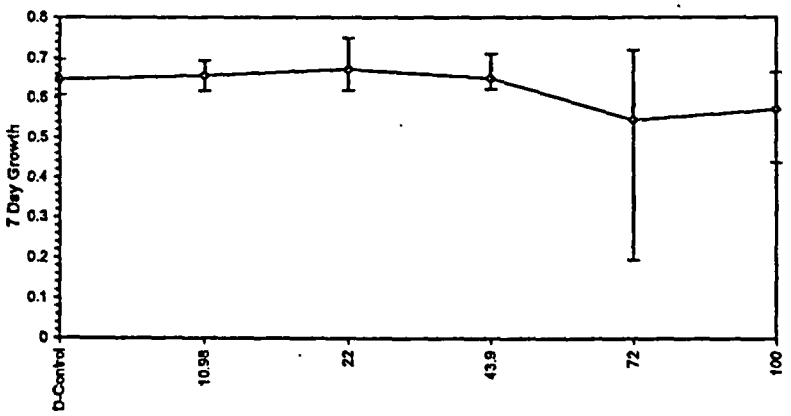
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs D-Control				

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	51.688			
IC10	61.783			
IC15	71.877			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



sqn_02-08-05data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	2/8/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101
End Date:	2/15/2005	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:	Non-treated				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
10.98	1.0000	0.9000	1.0000	1.0000
22	0.9000	1.0000	1.0000	1.0000
43.9	1.0000	1.0000	1.0000	1.0000
72	1.0000	0.9000	0.3000	1.0000
100	0.9000	0.8000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	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
10.98	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
22	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
43.9	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
72	0.8000	0.8000	1.1632	0.5796	1.4120	34.091	4	14.00	10.00	8	40
100	0.9250	0.9250	1.2951	1.1071	1.4120	11.347	4	14.00	10.00	3	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.772886395	0.884	-2.08092234	7.873614905
Equality of variance cannot be confirmed				

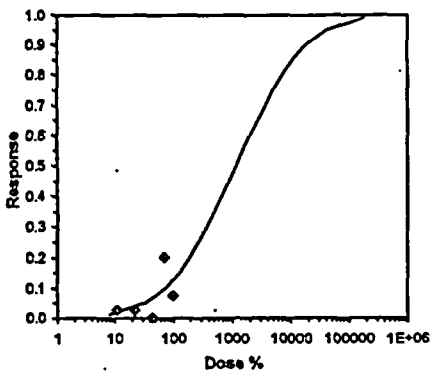
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs D-Control				

Maximum Likelihood-Probit

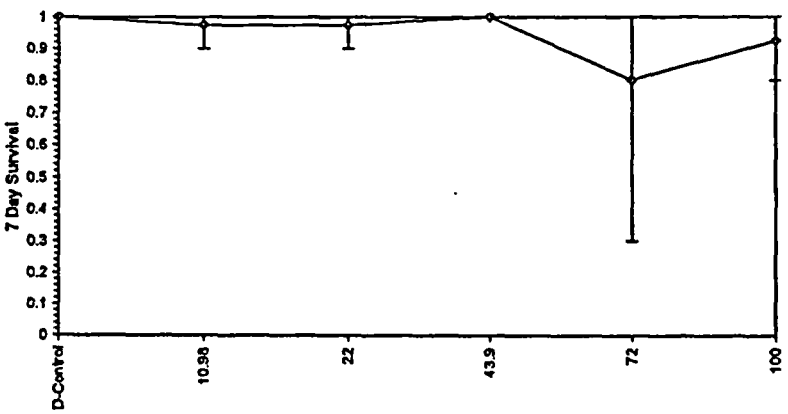
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.069729589	0.847548996	-1.62754953	3.767008704	0	9.02064725	7.814727783	3.0E-02	3.084288848	0.934815687	3
Intercept	1.700644959	1.483768448	-3.02136836	6.422658279							
TSCR											

Point	Probits	%	95% Fiducial Limits
EC01	2.674	8.120492172	
EC05	3.355	35.20901461	
EC10	3.718	76.96164709	
EC15	3.964	130.4411728	
EC20	4.158	198.3938192	
EC25	4.326	284.2924	
EC40	4.747	703.8109404	
EC50	5.000	1214.196179	
EC60	5.253	2094.699624	
EC75	5.674	5185.76039	
EC80	5.842	7431.040152	
EC85	6.036	11302.20345	
EC90	6.282	19155.9292	
EC95	6.645	41872.00181	
EC99	7.326	181549.7565	

Significant heterogeneity detected (p = 3.00E-02)



Dose-Response Plot



sqn_02-08-05data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Used for PMSD calculation only.			Larval Fish Growth and Survival Test-7 Day Growth		
Start Date:	2/8/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101
End Date:	2/15/2005	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:	Non-treated				

Conc-%	1	2	3	4
D-Control	0.6460	0.6070	0.6310	0.6970
10.98	0.6200	0.6160	0.6860	0.6920
22	0.6180	0.6530	0.7480	0.6640
43.9	0.7090	0.6210	0.6400	0.6260
72	0.7180	0.5860	0.1950	0.6810
100	0.5810	0.4380	0.5980	0.6640

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.6453	1.0000	0.6453	0.6070	0.6970	5.898	4			
10.98	0.6535	1.0128	0.6535	0.6160	0.6920	6.289	4	-0.105	2.410	0.1898
22	0.6708	1.0395	0.6708	0.6180	0.7480	8.216	4	-0.324	2.410	0.1898
43.9	0.6490	1.0058	0.6490	0.6210	0.7090	6.287	4	-0.048	2.410	0.1898
72	0.5450	0.8446	0.5450	0.1950	0.7180	44.012	4	1.273	2.410	0.1898
100	0.5703	0.8838	0.5703	0.4380	0.6640	16.687	4	0.952	2.410	0.1898

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.83706355	0.884	-1.78553777	6.5724703
Bartlett's Test indicates unequal variances (p = 4.83E-03)	16.8316841	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.18980068	0.29415061	0.01059594	0.01240485	0.52993709	5, 18
Treatments vs D-Control										

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/8/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Intake
End Date:	2/15/2005	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:	Non-treated				

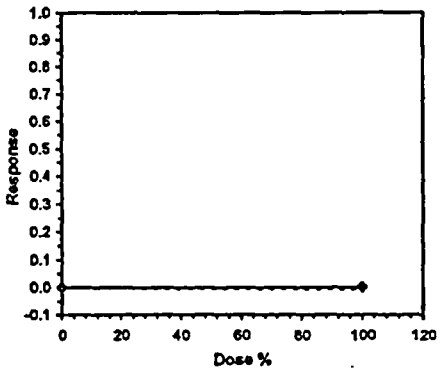
Conc-%	1	2	3	4
D-Control	0.6460	0.6070	0.6310	0.6970
100	0.6450	0.5900	0.7060	0.6540

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6453	1.0000	0.6453	0.6070	0.6970	5.898	4				0.6470	1.0000
100	0.6488	1.0054	0.6488	0.5900	0.7060	7.323	4	-0.115	1.943	0.0591	0.6470	1.0000

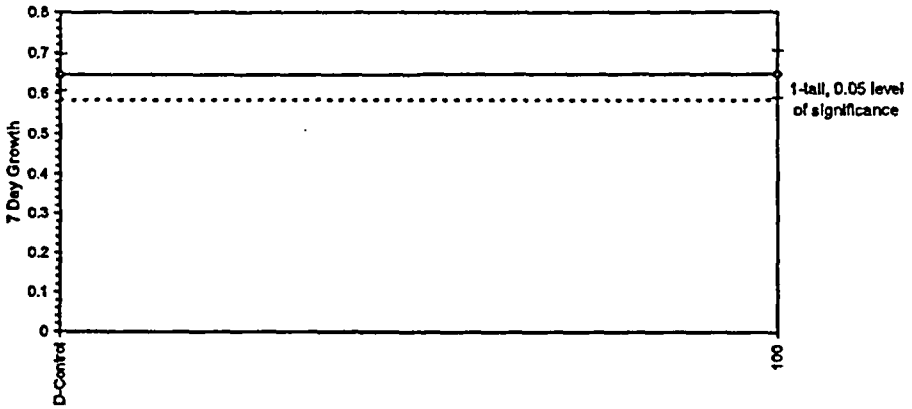
Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.942065716		0.749		0.19472182	-0.54745547
F-Test indicates equal variances (p = 0.72)	1.558375001		47.46722794			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates no significant differences	0.059140771	0.091655593	2.45E-05	0.001852583	0.912197888	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_02-08-05data

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 1684

County: Hamilton
Treatment: Non-treated
Outfall: 101

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:	ORANGE / BLUE
Date and times organisms were born between:	02-08-05 0806 TO 1044	Incubator number and shelf location:	2C2+3
Organism source:	02-01-05 A-F	YCT batch:	01-25-05
Transfer bowl information:	pH = 7.67 Temperature = 25.3C	*Selenastrum* batch:	02-03-05

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used HKS	Sample numbers used	Analyst
0	02-08-05	1116	02-06-05	050207.02+.03	JL
1	02-09-05	1038	02-06-05	050207.02+.03	JL
2	02-10-05	1022	02-07-05	050209.22+.23	JL
3	02-11-05	1030	02-07-05	050209.22+.23	JL
4	02-12-05	1041	02-10-05 B	050211.03+.04	JL
5	02-13-05	1037	02-10-05 B	050211.03+.04	JL
6	02-14-05	1044	02-12-05	050211.03+.04	JL
7	02-~~16~~ 15-05	1118			JL

Control information:	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:	30.1	29.6	≥ 15.0 offspring/female	ChV	>100%
% CV:	6.5%	~~4.4%~~	5.8% < 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-08-05

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	5	4	5	5	5	6	5	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	9	10	9	11	10	10	11	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	14	16	13	15	14	17	17	16	15	16
Total young produced		29	30	27	30	28	34	32	31	30	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

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.1

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	4	4	5	5	5	4	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	11	10	11	10	10	10	10	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	*1	*1	0	14	16	17	0	0	16	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	19	16	0	0	0	19	19	0	13
Total young produced		31	36	32	29	32	31	34	34	31	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.7
% Reduction from Control:	-5.3%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-08-05

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	5	4	5	5	5	5	5	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	13	11	12	10	12	10	10	9	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	0	0	18	0	0	0	15	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	*2	18	17	0	17	15	16	*3	16	14
Total young produced		32	35	33	35	32	32	31	32	30	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

*SPLIT BROOD

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.0
% Reduction from Control:	-6.3%

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	5	5	5	5	6	4	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	13	12	10	11	13	10	10	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	18	0	0	0	0	0	17	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	19	0	17	19	20	17	19	0	18
Total young produced		32	36	36	34	34	37	34	34	31	37
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.5
% Reduction from Control:	-14.6%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated **Date:** 02-08-05

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	5	4	5	5	6	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	11	11	10	13	12	10	13	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	20	0	16	17	0	0	0	18	20
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	0	20	0	0	18	19	19	0	0
Total young produced		33	37	36	31	32	36	37	33	36	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.6
% Reduction from Control:	-15.0%

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	6	4	5	6	5	6	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	14	14	12	10	14	11	11	12	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	0	0	17	0	18	20	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	17	19	0	19	0	0	21	20	17
Total young produced		35	35	38	35	34	38	35	37	37	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	35.8
% Reduction from Control:	-18.9%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-08-05

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	5	4	5	3	4	5	4	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	9	10	10	9	10	10	10	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	0	0	#1	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	15	15	16	16	15	12	17	16	14
Total young produced		31	28	30	30	29	30	26	31	32	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

CARRY OVER

Note: Adult mortality (L = live, D = dead)

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

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	5	4	4	4	5	4	5	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	12	11	12	12	10	13	10	11	12
	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	16	16	19	18	15	19	14	17	17	18
Total young produced		31	32	34	34	32	33	32	31	33	35
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead)

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.7
% Reduction from Control:	-10.5%

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	5	4	5	5	5	6	5	5	4	4	48
5	10	10	9	10	9	11	10	10	11	10	100
6	0	0	0	0	0	0	0	0	0	0	0
7	14	16	13	15	14	17	17	16	15	16	153
Total	29	30	27	30	28	34	32	31	30	30	301

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	5	4	5	5	6	4	5	4	48
5	12	12	11	11	10	13	12	10	13	11	115
6	0	20	0	16	17	0	0	0	18	20	91
7	16	0	20	0	0	18	19	19	0	0	92
Total	33	37	36	31	32	36	37	33	36	35	346

10.98%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	5	5	4	5	5	5	5	47
5	12	12	11	10	11	10	10	10	10	9	105
6	1	1	0	14	16	17	0	0	16	0	65
7	14	19	16	0	0	0	19	19	0	13	100
Total	31	36	32	29	32	31	34	34	31	27	317

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	6	4	5	6	5	6	4	5	5	5	51
5	12	14	14	12	10	14	11	11	12	12	122
6	17	0	0	17	0	18	20	0	0	0	72
7	0	17	19	0	19	0	0	21	20	17	113
Total	35	35	38	35	34	38	35	37	37	34	358

22%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	5	5	5	5	5	4	5	4	47
5	11	13	11	12	10	12	10	10	9	10	108
6	14	0	0	18	0	0	0	15	0	0	47
7	2	18	17	0	17	15	16	3	16	14	118
Total	32	35	33	35	32	32	31	32	30	28	320

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	5	4	5	3	4	5	4	4	4	5	43
5	10	9	10	10	9	10	10	10	12	10	100
6	16	0	0	1	0	0	0	0	0	0	17
7	0	15	15	16	16	15	12	17	16	14	136
Total	31	28	30	30	29	30	26	31	32	29	296

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	5	5	5	5	6	4	5	4	5	49
5	12	12	13	12	10	11	13	10	10	14	117
6	0	0	18	0	0	0	0	0	17	0	35
7	15	19	0	17	19	20	17	19	0	18	144
Total	32	36	36	34	34	37	34	34	31	37	345

100% Intake

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	5	4	5	4	5	5	45
5	10	12	11	12	12	10	13	10	11	12	113
6	0	0	0	0	0	0	0	0	0	0	0
7	16	16	19	18	15	19	14	17	17	18	169
Total	31	32	34	34	32	33	32	31	33	35	327

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: February 8-15, 2005

Project number: 1684

Reveiwed by: [signature]

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	29	30	27	30	28	34	32	31	30	30	100	30.1	6.5	Not applicable
10.98%	31	36	32	29	32	31	34	34	31	27	100	31.7	8.2	-5.3
22%	32	35	33	35	32	32	31	32	30	28	100	32.0	6.6	-6.3
43.9%	32	36	36	34	34	37	34	34	31	37	100	34.5	5.8	-14.6
72%	33	37	36	31	32	36	37	33	36	35	100	34.6	6.3	-15.0
100%	35	35	38	35	34	38	35	37	37	34	100	35.8	4.3	-18.9
Control - 2	31	28	30	30	29	30	26	31	32	29	100	29.6	5.8	Not applicable
100% Intake	31	32	34	34	32	33	32	31	33	35	100	32.7	4.1	-10.5

Outfall 101:
Dunnett's MSD value: 2.136
PMSD: 7.1

Intake:
Dunnett's MSD value: 1.192
PMSD: 4.0

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 *Ceriodaphnia* reproduction by 9.7% 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:	2/8/2005	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101
End Date:	2/15/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

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

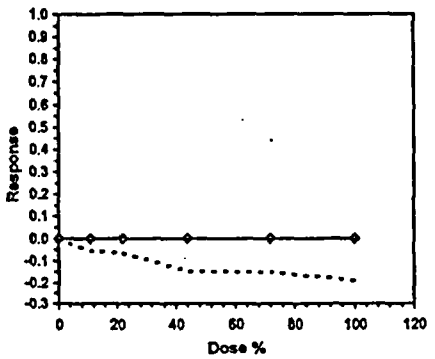
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	30.100	1.0000	30.100	27.000	34.000	6.542	10				33.117	1.0000
10.98	31.700	1.0532	31.700	27.000	36.000	8.152	10	-1.713	2.287	2.136	33.117	1.0000
22	32.000	1.0631	32.000	28.000	35.000	6.588	10	-2.034	2.287	2.136	33.117	1.0000
43.9	34.500	1.1462	34.500	31.000	37.000	5.837	10	-4.711	2.287	2.136	33.117	1.0000
72	34.600	1.1495	34.600	31.000	37.000	6.273	10	-4.818	2.287	2.136	33.117	1.0000
100	35.800	1.1894	35.800	34.000	38.000	4.327	10	-6.103	2.287	2.136	33.117	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.653808415	1.035	-0.12875496	-0.34410075
Bartlett's Test indicates equal variances (p = 0.81)	2.28775382	15.08627224		

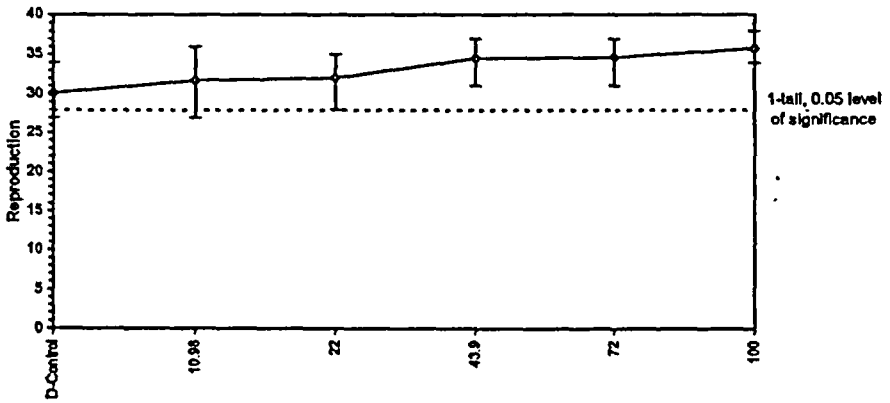
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.135582867	0.070949597	47.33666667	4.361111111	2.9E-07	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_02-08-05data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	2/8/2005	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Intake
End Date:	2/15/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	28.000	30.000	30.000	29.000	30.000	26.000	31.000	32.000	29.000
100	31.000	32.000	34.000	34.000	32.000	33.000	32.000	31.000	33.000	35.000

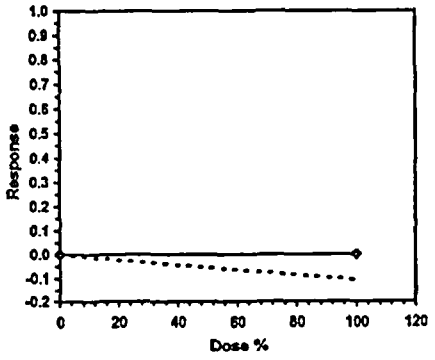
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	29.600	1.0000	29.600	26.000	32.000	5.786	10				31.150	1.0000
100	32.700	1.1047	32.700	31.000	35.000	4.090	10	-4.511	1.734	1.192	31.150	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.956004024	0.868	-0.45309148	0.313519723
F-Test indicates equal variances (p = 0.47)	1.639751554	6.541089535		

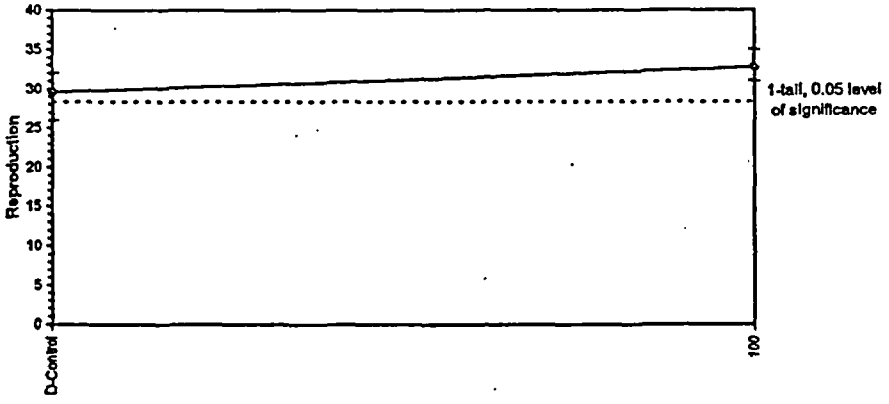
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	1.191621248	0.040257475	48.05	2.361111111	2.7E-04	1, 18
Treatments vs D-Control						

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_02-08-05data

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 1684

County: Hamilton
Treatment: UV-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	Each concentration was treated
Effluent volume (mL)	274.5	550	1097.5	1800	2500	for 2 minutes with a UV sterilizer
Diluent volume (mL)	2225.5	1950	1402.5	700	0	to remove pathogenic
Total volume (mL)	2500	2500	2500	2500	2500	interferences.

Test organism information:		*Test information:*	
Organism age:	21.5 TO 24.5-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	02-07-05 1300 TO 1600	Incubator number:	5B
Organism source:	ABS BATCH 02-07-05	*Artemia* lot number:	BG1005S
Transfer bowl information:	pH = 7.62 Temperature = 24.3 °C	Total drying time:	24-HOURS
		Date / Time in: 02-15-05	1415
Average transfer volume:	9.5 mL	Date / Time out: 02-16-05	1420
		Oven temperature:	61°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Sample numbers used	Analyst
0	02-08-05	—	1450	1330	02-06-05	050207.02+.03	JL
1	02-09-05	0932	1530	1300	02-06-05	050209.02+.03	JL
2	02-10-05	0930	1534	1311	02-07-05	050209.22+.23	JL
3	02-11-05	0925	1530	1304	02-07-05	050209.22+.23	JL
4	02-12-05	0920	1533	1240	02-10-05B	050211.03+.04	KEK
5	02-13-05	0930	1533	1236	02-10-05B	050211.03+.04	KEK
6	02-14-05	0921	1600	1244	02-12-05	050211.03+.04	KEK
7	02-15-05			1241			JL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.695		NOEC	100%
Average weight per surviving larvae:	0.695	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 02-08-05

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	10	10	10	10	9 d	10	10	10	10
6	10	10	10	10	10	10	10	~~10~~ 9	10	10	10	10
7	10	ILG 10	10	ILG 10	ILG 10	ILG 10	10	~~10~~ 9	10	10	10	10
A = Pan weight (mg) Blue Color identification: Beaker Analyst: PCB	14.52	14.53	14.63	14.65	14.70	14.73	14.51	14.49	14.83	15.07	14.85	14.84
B = Pan + Larvae weight (mg) Analyst: JA	20.84	21.91	21.62	21.76	22.08	22.16	21.61	20.34	21.42	21.54	21.83	21.84
Larvae weight (mg) = A – B	6.32	7.38	6.99	7.11	7.38	7.43	7.10	5.85	6.59	6.47	6.98	7.00
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.632	0.738	0.699	0.711	0.738	0.743	0.710	0.585	0.659	0.647	0.698	0.700
Average weight per initial number of larvae (mg)	0.695				0.694				0.676			
Percent reduction from control (%)					0.1%				2.7%			

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: JA

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 02-08-05

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	9'd	10	10
4	10	10	10	10	10	10	10	10	10	9	10	10
5	10	10	10	10	10	10	10	10	10	9	10	10
6	10	10	10	10	10	10	10	10	10	9	10	10
7	10	10	10	10	ISM 10	10	ISM 10	10	10	9	ISM 10	10
A = Pan weight (mg) Color Identification: Blue Beaker Analyst: PCB	14.90	15.45	14.77	14.94	14.51	15.00	14.64	14.94	14.68	15.07	14.89	15.10
B = Pan + Larvae weight (mg) Analyst: dl	21.17	22.51	21.75	21.67	20.28	21.92	20.31	21.16	21.87	20.82	20.36	22.16
Larvae weight (mg) = A – B	6.27	7.06	6.98	6.73	5.77	6.92	5.67	6.22	7.19	5.75	5.47	7.06
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.627	0.706	0.698	0.673	0.577	0.692	0.567	0.622	0.719	0.575	0.547	0.706
Average weight per initial number of larvae (mg)	0.676				0.615				0.637			
Percent reduction from control (%)		2.7%				11.6%				8.4%		

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: 02-08-05

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) Color identification: Blue Beaker Analyst: PCB	14.78	14.98	14.83	14.95
B = Pan + Larvae weight (mg) Analyst: dl	21.12	22.05	21.07	21.70
Larvae weight (mg) = A – B	6.34	7.07	6.24	6.75
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.634	0.707	0.624	0.675
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.660		5.0%	

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:

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: February 8-15, 2005
Project number: 1684

Reviewed by: [illegible]

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	14.52	20.84	6.32	0.632	0.695	6.5	0.632	100.0	0.695	6.5	Not applicable
	B	10	10	14.53	21.91	7.38	0.738			0.738				
	C	10	10	14.63	21.62	6.99	0.699			0.699				
	D	10	10	14.65	21.76	7.11	0.711			0.711				
10.98%	E	10	10	14.70	22.08	7.38	0.738	0.710	6.0	0.738	97.5	0.694	10.7	0.1
	F	10	10	14.73	22.16	7.43	0.743			0.743				
	G	10	10	14.51	21.61	7.10	0.710			0.710				
	H	10	9	14.49	20.34	5.85	0.650			0.585				
22%	I	10	10	14.83	21.42	6.59	0.659	0.676	4.0	0.659	100.0	0.676	4.0	2.7
	J	10	10	15.07	21.54	6.47	0.647			0.647				
	K	10	10	14.85	21.83	6.98	0.698			0.698				
	L	10	10	14.84	21.84	7.00	0.700			0.700				
43.9%	M	10	10	14.90	21.17	6.27	0.627	0.676	5.3	0.627	100.0	0.676	5.3	2.7
	N	10	10	15.45	22.51	7.06	0.706			0.706				
	O	10	10	14.77	21.75	6.98	0.698			0.698				
	P	10	10	14.94	21.67	6.73	0.673			0.673				
72%	Q	10	10	14.51	20.28	5.77	0.577	0.615	9.3	0.577	100.0	0.615	9.3	11.6
	R	10	10	15.00	21.92	6.92	0.692			0.692				
	S	10	10	14.64	20.31	5.67	0.567			0.567				
	T	10	10	14.94	21.16	6.22	0.622			0.622				
100%	U	10	10	14.68	21.87	7.19	0.719	0.653	12.1	0.719	97.5	0.637	13.9	8.4
	V	10	9	15.07	20.82	5.75	0.639			0.575				
	W	10	10	14.89	20.36	5.47	0.547			0.547				
	X	10	10	15.10	22.16	7.06	0.706			0.706				
100% Intake	Y	10	10	14.78	21.12	6.34	0.634	0.660	5.8	0.634	100.0	0.660	5.8	5.0
	Z	10	10	14.98	22.05	7.07	0.707			0.707				
	AA	10	10	14.83	21.07	6.24	0.624			0.624				
	BB	10	10	14.95	21.70	6.75	0.675			0.675				

Outfall 101:
Dunnett's MSD value: 0.0998
PMSD: 14.4

Intake:
Dunnett's MSD value: 0.0575
PMSD: 8.3

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 15.7% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/8/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Outfall 101
End Date:	2/15/2005	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:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.6320	0.7380	0.6990	0.7110
10.98	0.7380	0.7430	0.7100	0.5850
22	0.6590	0.6470	0.6980	0.7000
43.9	0.6270	0.7060	0.6980	0.6730
72	0.5770	0.6920	0.5670	0.6220
100	0.7190	0.5750	0.5470	0.7060

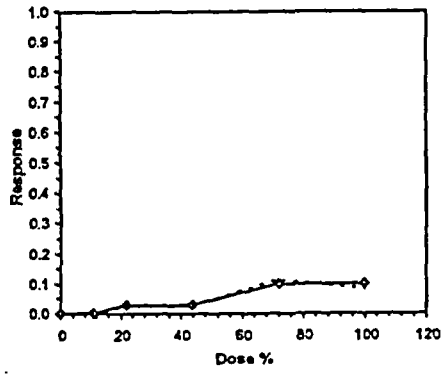
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6950	1.0000	0.6950	0.6320	0.7380	6.483	4				0.6950	1.0000
10.98	0.6940	0.9986	0.6940	0.5850	0.7430	10.678	4	0.024	2.410	0.0998	0.6940	0.9986
22	0.6760	0.9727	0.6760	0.6470	0.7000	3.997	4	0.459	2.410	0.0998	0.6760	0.9727
43.9	0.6760	0.9727	0.6760	0.6270	0.7060	5.261	4	0.459	2.410	0.0998	0.6760	0.9727
72	0.6145	0.8842	0.6145	0.5670	0.6920	9.265	4	1.944	2.410	0.0998	0.6256	0.9002
100	0.6368	0.9162	0.6368	0.5470	0.7190	13.879	4	1.407	2.410	0.0998	0.6256	0.9002

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.966917574	0.884	-0.37658876	-0.53621699
Bartlett's Test indicates equal variances (p = 0.43)	4.857076645	15.08627224		

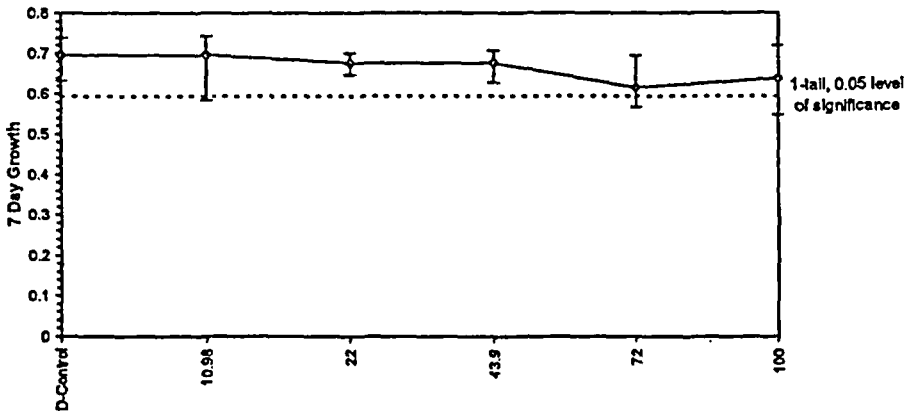
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.099773349	0.143558775	0.004264375	0.003427875	0.329913467	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	52.686			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Dose-Response Plot



sqn_02-08-05data

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/8/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant - Intake
End Date:	2/15/2005	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:	UV-treated				

Conc-%	1	2	3	4
D-Control	0.6320	0.7380	0.6990	0.7110
100	0.6340	0.7070	0.6240	0.6750

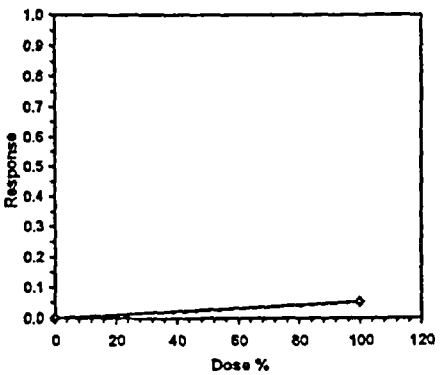
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6950	1.0000	0.6950	0.6320	0.7380	6.483	4				0.6950	1.0000
100	0.6600	0.9496	0.6600	0.6240	0.7070	5.807	4	1.183	1.943	0.0575	0.6600	0.9496

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.943340778		0.749		-0.4048708	-0.88864687
F-Test indicates equal variances (p = 0.80)	1.382206082		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	0.057469099	0.082689352	0.00245	0.001749333	0.281393141	1, 6

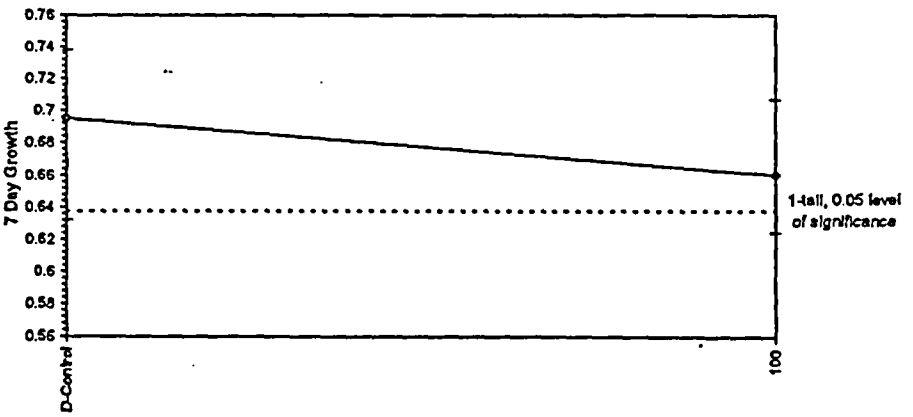
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	99.286			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



sqn_02-08-05data

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: February 08 - 15, 2005

Project number: 1684

Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.86	7.58	7.86	7.55	7.72	7.46	7.82	7.54	7.80	7.85	7.96	7.79	8.11	7.39
	DO (mg/L)	7.7	7.6	7.8	7.7	7.8	7.7	7.8	7.5	7.7	7.1	7.7	7.3	7.8	7.3
	Conductivity (µmhos/cm)	303		308		295		283		307		282		289	
	Alkalinity (mg/L $CaCO_3$)	58				64				62				61	
	Hardness (mg/L $CaCO_3$)	81				86				84				86	
	Temperature (°C)	25.1	24.8	25.2	24.7	25.3	24.5	25.3	24.5	24.9	24.7	24.9	24.5	25.2	24.6
10.98%	pH (SU)	7.76	7.51	7.72	7.52	7.69	7.41	7.61	7.55	7.91	7.85	8.17	7.79	8.22	7.41
	DO (mg/L)	7.7	7.6	7.9	7.7	7.9	7.5	7.7	7.5	7.8	7.2	8.1	7.3	8.1	7.4
	Conductivity (µmhos/cm)	286		304		278		271		294		275		279	
	Temperature (°C)	25.2	24.6	25.1	24.6	25.2	24.3	25.1	24.5	24.8	24.6	25.1	24.3	25.0	24.6
22%	pH (SU)	7.75	7.52	7.72	7.51	7.67	7.47	7.62	7.55	7.92	7.84	8.18	7.72	8.21	7.42
	DO (mg/L)	7.7	7.5	7.9	7.6	7.9	7.5	7.8	7.5	7.8	7.2	8.0	7.2	8.2	7.4
	Conductivity (µmhos/cm)	271		295		276		267		298		265		269	
	Temperature (°C)	25.2	24.6	25.3	24.7	25.2	24.3	25.1	24.7	24.8	24.6	25.1	24.3	25.0	24.8
43.9%	pH (SU)	7.76	7.51	7.72	7.54	7.66	7.49	7.61	7.58	7.90	7.87	8.18	7.75	8.23	7.42
	DO (mg/L)	7.7	7.5	7.9	7.6	8.0	7.6	7.8	7.6	7.8	7.1	7.9	7.2	8.2	7.4
	Conductivity (µmhos/cm)	240		273		248		241		288		243		243	
	Temperature (°C)	25.4	24.6	25.3	24.7	25.3	24.4	25.3	24.4	24.8	24.8	25.2	24.6	24.9	24.5
72%	pH (SU)	7.75	7.50	7.71	7.55	7.63	7.52	7.57	7.58	7.91	7.85	8.18	7.78	8.23	7.46
	DO (mg/L)	7.7	7.4	7.9	7.6	8.1	7.6	7.7	7.6	7.7	7.1	7.8	7.3	8.3	7.4
	Conductivity (µmhos/cm)	212		231		213		205		255		205		207	
	Temperature (°C)	25.3	24.7	25.2	24.5	25.1	24.3	25.1	24.6	24.9	24.6	25.2	24.3	24.9	24.6
100%	pH (SU)	7.75	7.53	7.69	7.56	7.62	7.53	7.59	7.59	7.90	7.85	8.20	7.91	8.25	7.48
	DO (mg/L)	7.7	7.4	7.8	7.6	8.2	7.6	7.8	7.6	7.7	7.0	7.8	7.6	8.3	7.5
	Conductivity (µmhos/cm)	175		204		179		174		225		177		177	
	Alkalinity (mg/L $CaCO_3$)	68				67				66					
	Hardness (mg/L $CaCO_3$)	82				80				78					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.4	24.8	25.3	24.5	25.3	24.3	25.2	24.5	25.1	24.7	25.1	24.4	25.1	24.5
100% Intake	pH (SU)	7.76	7.51	7.72	7.56	7.61	7.49	7.65	7.55	7.90	7.87	8.14	7.83	8.27	7.50
	DO (mg/L)	7.7	7.4	7.8	7.6	8.2	7.7	7.9	7.7	7.8	7.1	7.7	7.1	8.3	7.5
	Conductivity (µmhos/cm)	181		201		178		173		223		183		181	
	Alkalinity (mg/L $CaCO_3$)	68				66				68					
	Hardness (mg/L $CaCO_3$)	78				80				80					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.6	25.2	24.5	25.1	24.5	25.2	24.5	25.0	24.7	25.3	24.4	25.0	24.6

Species: *Pimephales promelas* Date: 02-08-05
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.)	7.86	7.58	7.86	7.55	7.72	7.46
	DO (mg/L)	7.7	7.6	7.8	7.7	7.8	7.7
	Conductivity (µmhos/cm)	303		308		295	
	Alkalinity (mg $CaCO_3$/L)	58				64	
	Hardness (mg $CaCO_3$/L)	81				86	
	Temperature (°C)	25.1	24.8	25.2	24.7	25.3	24.5
10.98%	pH (S.U.)	7.76	7.51	7.72	7.52	7.69	7.41
	DO (mg/L)	7.7	7.6	7.9	7.7	7.9	7.5
	Conductivity (µmhos/cm)	286		304		278	
	Temperature (°C)	25.2	24.6	25.1	24.6	25.2	24.3
22%	pH (S.U.)	7.75	7.52	7.72	7.51	7.67	7.47
	DO (mg/L)	7.7	7.5	7.9	7.6	7.9	7.5
	Conductivity (µmhos/cm)	271		295		276	
	Temperature (°C)	25.2	24.6	25.3	24.7	25.2	24.3
43.9%	pH (S.U.)	7.76	7.51	7.72	7.54	7.66	7.49
	DO (mg/L)	7.7	7.5	7.9	7.6	8.0	7.6
	Conductivity (µmhos/cm)	240		273		248	
	Temperature (°C)	25.4	24.6	25.3	24.7	25.3	24.4
72%	pH (S.U.)	7.75	7.50	7.71	7.55	7.63	7.52
	DO (mg/L)	7.7	7.4	7.9	7.6	8.1	7.6
	Conductivity (µmhos/cm)	212		231		213	
	Temperature (°C)	25.3	24.7	25.2	24.5	25.1	24.3
100%	pH (S.U.)	7.75	7.53	7.69	7.56	7.62	7.53
	DO (mg/L)	7.7	7.4	7.8	7.6	8.2	7.6
	Conductivity (µmhos/cm)	175		204		179	
	Alkalinity (mg $CaCO_3$/L)	68				67	
	Hardness (mg $CaCO_3$/L)	82				80	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.4	24.8	25.3	24.5	25.3	24.3
100% Intake	pH (S.U.)	7.76	7.51	7.72	7.56	7.61	7.49
	DO (mg/L)	7.7	7.4	7.8	7.6	8.2	7.7
	Conductivity (µmhos/cm)	181		201		178	
	Alkalinity (mg $CaCO_3$/L)	68				66	
	Hardness (mg $CaCO_3$/L)	78				80	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.6	25.2	24.5	25.1	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 02-08-05
Client: TVA / Sequoyah Nuclear Plant – Non-treated

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	KHL	KHL	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	7.82	7.54	7.80	7.85	7.96	7.79	8.11	7.39
	DO (mg/L)	7.8	7.5	7.7	7.4 (7.1)	7.7	7.3	7.0	7.3
	Conductivity (µmhos/cm)	283		307		282		209	
	Alkalinity (mg $CaCO_3$/L)			62				61	
	Hardness (mg $CaCO_3$/L)			84				86	
	Temperature (°C)	25.3	24.5	24.9	24.7	24.9	24.5	25.2	24.6
10.98%	pH (S.U.)	7.61	7.55	7.91	7.85	8.17	7.79	8.22	7.44
	DO (mg/L)	7.7	7.5	7.8	7.4 (7.2)	8.1	7.3	8.1	7.4
	Conductivity (µmhos/cm)	271		294		275		279	
	Temperature (°C)	25.1	24.5	24.8	24.6	25.1	24.3	25.0	24.6
22%	pH (S.U.)	7.62	7.55	7.92	7.84	8.18	7.72	8.21	7.42
	DO (mg/L)	7.8	7.5	7.8	7.5 (7.2)	8.0	7.2	8.2	7.4
	Conductivity (µmhos/cm)	267		298		265		269	
	Temperature (°C)	25.1	24.7	24.8	24.6	25.1	24.3	25.0	24.8
43.9%	pH (S.U.)	7.61	7.58	7.90	7.87	8.18	7.75	8.23	7.47
	DO (mg/L)	7.8	7.6	7.8	7.3 (7.1)	7.9	7.2	8.2	7.4
	Conductivity (µmhos/cm)	241		288		243		243	
	Temperature (°C)	25.3	24.4	24.8	24.8	25.2	24.6	24.9	24.5
72%	pH (S.U.)	7.57	7.58	7.91	7.85	8.18	7.70	8.23	7.46
	DO (mg/L)	7.7	7.6	7.7	7.4 (7.1)	7.8	7.3	8.3	7.4
	Conductivity (µmhos/cm)	205		255		205		207	
	Temperature (°C)	25.1	24.6	24.9	24.6	25.2	24.3	24.9	24.6
100%	pH (S.U.)	7.59	7.59	7.90	7.85	8.20	7.91	8.25	7.48
	DO (mg/L)	7.8	7.6	7.7	7.3 (7.0)	7.8	7.6	8.3	7.5
	Conductivity (µmhos/cm)	174		225		177		177	
	Alkalinity (mg $CaCO_3$/L)			66					
	Hardness (mg $CaCO_3$/L)			78					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.5	25.1	24.7	25.1	24.4	25.1	24.5
100% Intake	pH (S.U.)	7.65	7.55	7.90	7.87	8.14	7.83	8.27	7.50
	DO (mg/L)	7.9	7.7	7.8	7.5 (7.1)	7.7	7.1	8.3	7.5
	Conductivity (µmhos/cm)	173		223		183		181	
	Alkalinity (mg $CaCO_3$/L)			68					
	Hardness (mg $CaCO_3$/L)			80					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.5	25.0	24.7	25.3	24.4	25.0	24.6
		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: February 08 - 15, 2005

Project number: 1684

Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.86	7.57	7.86	7.61	7.72	7.57	7.82	7.74	7.80	8.05	7.96	8.13	8.11	7.63
	DO (mg/L)	7.7	7.7	7.8	7.9	7.8	7.9	7.8	7.6	7.7	7.4	7.7	8.0	7.8	7.7
	Conductivity (µmhos/cm)	303		308		295		283		307		282		289	
	Alkalinity (mg/L $CaCO_3$)	58				64				62				61	
	Hardness (mg/L $CaCO_3$)	81				86				84				86	
	Temperature (°C)	25.1	24.9	25.3	24.7	25.2	24.6	24.8	24.8	24.9	24.6	24.7	24.4	24.9	24.5
10.98%	pH (SU)	7.76	7.59	7.72	7.61	7.69	7.59	7.61	7.74	7.91	8.06	8.17	8.12	8.22	7.61
	DO (mg/L)	7.7	7.7	7.9	8.0	7.9	8.0	7.7	7.6	7.8	7.4	8.1	8.1	8.1	7.8
	Conductivity (µmhos/cm)	286		304		278		271		294		275		279	
	Temperature (°C)	25.1	25.1	25.1	25.1	25.1	24.5	25.1	24.6	25.2	24.6	24.7	24.5	25.0	24.6
22%	pH (SU)	7.75	7.58	7.72	7.62	7.67	7.58	7.62	7.73	7.92	8.07	8.18	8.11	8.21	7.60
	DO (mg/L)	7.7	7.7	7.9	7.9	7.9	8.0	7.8	7.7	7.8	7.5	8.0	8.1	8.2	7.8
	Conductivity (µmhos/cm)	271		295		276		267		298		265		269	
	Temperature (°C)	25.1	25.1	25.1	24.7	25.1	24.7	25.1	24.6	25.0	24.5	24.7	24.4	25.0	24.5
43.9%	pH (SU)	7.76	7.59	7.72	7.64	7.66	7.59	7.61	7.74	7.90	8.08	8.18	8.12	8.23	7.61
	DO (mg/L)	7.7	7.7	7.9	7.9	8.0	8.1	7.8	7.7	7.8	7.3	7.9	8.1	8.2	7.9
	Conductivity (µmhos/cm)	240		273		248		241		288		243		243	
	Temperature (°C)	25.1	25.0	25.0	24.8	25.0	24.7	25.1	24.7	25.1	24.6	24.6	24.4	25.1	24.5
72%	pH (SU)	7.75	7.61	7.71	7.64	7.63	7.59	7.57	7.74	7.91	8.09	8.18	8.14	8.23	7.61
	DO (mg/L)	7.7	7.6	7.9	7.9	8.1	8.0	7.7	7.7	7.7	7.4	7.8	8.1	8.3	7.9
	Conductivity (µmhos/cm)	212		231		213		205		255		205		207	
	Temperature (°C)	25.3	25.2	25.1	24.8	25.0	24.6	25.3	24.6	25.1	24.6	24.7	24.3	25.1	24.7
100%	pH (SU)	7.75	7.63	7.69	7.65	7.62	7.59	7.59	7.73	7.90	8.11	8.20	8.17	8.25	7.64
	DO (mg/L)	7.7	7.6	7.8	8.0	8.2	8.1	7.8	7.7	7.7	7.3	7.8	8.2	8.3	8.0
	Conductivity (µmhos/cm)	175		204		179		174		225		177		177	
	Alkalinity (mg/L $CaCO_3$)	68				67				66					
	Hardness (mg/L $CaCO_3$)	82				80				78					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.3	24.9	25.0	24.7	24.9	24.7	25.2	24.6	25.3	24.6	24.5	24.3	25.1	24.6
100% Intake	pH (SU)	7.76	7.89	7.72	7.61	7.61	7.58	7.65	7.67	7.90	8.07	8.14	8.15	8.27	7.61
	DO (mg/L)	7.7	7.7	7.8	7.8	8.2	8.1	7.9	7.8	7.8	7.5	7.7	8.2	8.3	8.0
	Conductivity (µmhos/cm)	181		201		178		173		223		183		181	
	Alkalinity (mg/L $CaCO_3$)	68				66				68					
	Hardness (mg/L $CaCO_3$)	78				80				80					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.9	25.3	24.7	25.1	24.5	25.2	24.6	25.0	24.6	24.6	24.5	25.0	24.4

Species: *Ceriodaphnia dubia* Date: 02-08-05
Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	7.86	7.57	7.86	7.61	7.72	7.57
	DO (mg/L)	7.7	7.7	7.8	7.9	7.8	7.9
	Conductivity (µmhos/cm)	303		308		295	
	Alkalinity (mg $CaCO_3$/L)	58				64	
	Hardness (mg $CaCO_3$/L)	81				86	
	Temperature (°C)	25.1	24.9	25.3	24.7	25.2	24.6
10.98%	pH (S.U.)	7.76	7.59	7.72	7.61	7.69	7.59
	DO (mg/L)	7.7	7.7	7.9	8.0	7.9	8.0
	Conductivity (µmhos/cm)	286		304		278	
	Temperature (°C)	25.1	25.1	25.1	25.1	25.1	24.5
22%	pH (S.U.)	7.75	7.58	7.72	7.62	7.67	7.58
	DO (mg/L)	7.7	7.7	7.9	7.9	7.9	8.0
	Conductivity (µmhos/cm)	271		295		276	
	Temperature (°C)	25.1	25.1	25.1	24.7	25.1	24.7
43.9%	pH (S.U.)	7.76	7.59	7.72	7.64	7.66	7.59
	DO (mg/L)	7.7	7.7	7.9	7.9	8.0	8.1
	Conductivity (µmhos/cm)	240		273		248	
	Temperature (°C)	25.1	25.0	25.0	24.8	25.0	24.7
72%	pH (S.U.)	7.75	7.61	7.71	7.64	7.63	7.59
	DO (mg/L)	7.7	7.6	7.9	7.9	8.1	8.0
	Conductivity (µmhos/cm)	212		231		213	
	Temperature (°C)	25.3	25.2	25.1	24.8	25.0	24.6
100%	pH (S.U.)	7.75	7.63	7.69	7.65	7.62	7.59
	DO (mg/L)	7.7	7.6	7.8	8.0	8.2	8.1
	Conductivity (µmhos/cm)	175		204		179	
	Alkalinity (mg $CaCO_3$/L)	68				67	
	Hardness (mg $CaCO_3$/L)	82				80	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.3	24.9	25.0	24.7	24.9	24.7
100% Intake	pH (S.U.)	7.76	7.89	7.72	7.61	7.61	7.58
	DO (mg/L)	7.7	7.7	7.8	7.8	8.2	8.1
	Conductivity (µmhos/cm)	181		201		178	
	Alkalinity (mg $CaCO_3$/L)	68				66	
	Hardness (mg $CaCO_3$/L)	78				80	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.9	25.3	24.7	25.1	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 02-08-05

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	CAJ	KEY	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	7.82	7.74	7.80	8.05	7.96	8.13	8.11	7.63
	DO (mg/L)	7.8	7.6	7.7	7.4	7.7	8.0	7.8	7.7
	Conductivity (µmhos/cm)	283		307		282		289	
	Alkalinity (mg $CaCO_3$/L)			62				61	
	Hardness (mg $CaCO_3$/L)			84				86	
	Temperature (°C)	24.8	24.8	24.9	24.6	24.7	24.4	24.9	24.5
10.98%	pH (S.U.)	7.61	7.74	7.91	8.06	8.17	8.12	8.22	7.61
	DO (mg/L)	7.7	7.6	7.8	7.4	8.1	8.1	8.1	7.8
	Conductivity (µmhos/cm)	271		294		275		279	
	Temperature (°C)	25.1	24.6	25.2	24.6	24.7	24.5	25.0	24.6
22%	pH (S.U.)	7.62	7.73	7.92	8.07	8.18	8.11	8.21	7.60
	DO (mg/L)	7.8	7.7	7.8	7.5	8.0	8.1	8.2	7.8
	Conductivity (µmhos/cm)	267		298		265		269	
	Temperature (°C)	25.1	24.6	25.0	24.5	24.7	24.4	25.0	24.5
43.9%	pH (S.U.)	7.61	7.74	7.90	8.08	8.18	8.12	8.23	7.61
	DO (mg/L)	7.8	7.7	7.8	7.3	7.9	8.1	8.2	7.9
	Conductivity (µmhos/cm)	241		288		243		243	
	Temperature (°C)	25.1	24.7	25.1	24.6	24.6	24.4	25.1	24.5
72%	pH (S.U.)	7.57	7.74	7.91	8.09	8.18	8.14	8.23	7.61
	DO (mg/L)	7.7	7.7	7.7	7.4	7.8	8.1	8.3	7.9
	Conductivity (µmhos/cm)	205		255		205		207	
	Temperature (°C)	25.3	24.6	25.1	24.6	24.7	24.3	25.1	24.7
100%	pH (S.U.)	7.59	7.73	7.90	8.11	8.20	8.17	8.25	7.64
	DO (mg/L)	7.8	7.7	7.7	7.3	7.8	8.2	8.3	8.0
	Conductivity (µmhos/cm)	174		225		177		177	
	Alkalinity (mg $CaCO_3$/L)			66					
	Hardness (mg $CaCO_3$/L)			78					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.6	25.3	24.6	24.5	24.3	25.1	24.6
100% Intake	pH (S.U.)	7.65	~~7.54~~	7.67	7.90	8.07	8.14	8.15	8.27	7.61
	DO (mg/L)	7.9	7.8	7.8	7.5	7.7	8.2	8.3	8.0
	Conductivity (µmhos/cm)	173		223		183		181	
	Alkalinity (mg $CaCO_3$/L)			68					
	Hardness (mg $CaCO_3$/L)			80					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.6	25.0	24.6	24.6	24.5	25.0	24.4
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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: February 08 - 15, 2005

Project number: 1684

Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.76	7.57	7.73	7.54	7.71	7.40	7.70	7.55	7.75	7.79	8.11	7.76	8.20	7.42
	DO (mg/L)	7.8	7.6	7.8	7.6	8.0	7.5	8.0	7.7	7.9	7.2	7.8	7.4	8.3	7.4
	Conductivity (µmhos/cm)	292		312		284		283		341		278		281	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Temperature (°C)	25.1	24.6	25.2	24.5	25.2	24.4	25.2	24.6	24.8	24.5	24.9	24.4	24.9	24.4
10.98%	pH (SU)	7.78	7.58	7.72	7.54	7.70	7.43	7.68	7.52	7.73	7.79	8.12	7.75	8.20	7.41
	DO (mg/L)	7.8	7.6	7.8	7.7	8.0	7.4	8.1	7.8	8.0	7.1	7.8	7.3	8.4	7.4
	Conductivity (µmhos/cm)	277		301		284		279		326		272		279	
	Temperature (°C)	25.2	24.7	25.4	24.6	25.3	24.3	25.3	24.7	24.8	24.4	24.9	24.3	25.1	24.4
22%	pH (SU)	7.76	7.57	7.73	7.56	7.69	7.41	7.71	7.56	7.74	7.82	8.13	7.74	8.20	7.39
	DO (mg/L)	7.8	7.6	7.8	7.6	8.1	7.4	8.1	7.6	8.0	7.1	7.8	7.2	8.5	7.3
	Conductivity (µmhos/cm)	270		290		271		265		306		270		271	
	Temperature (°C)	25.2	24.6	25.3	24.4	25.3	24.4	25.3	24.7	24.9	24.6	25.1	24.3	25.1	24.4
43.9%	pH (SU)	7.78	7.53	7.73	7.54	7.68	7.40	7.72	7.56	7.74	7.80	8.14	7.74	8.21	7.38
	DO (mg/L)	7.8	7.6	7.8	7.7	8.1	7.5	8.2	7.7	7.9	7.1	7.8	7.3	8.5	7.4
	Conductivity (µmhos/cm)	240		265		237		244		289		243		244	
	Temperature (°C)	25.4	24.8	25.3	24.5	25.1	24.6	25.1	24.7	24.9	24.6	25.1	24.5	25.0	24.1
72%	pH (SU)	7.78	7.52	7.71	7.59	7.67	7.53	7.72	7.61	7.75	7.84	8.14	7.84	8.21	7.47
	DO (mg/L)	7.8	7.5	7.8	7.7	8.1	7.5	8.2	7.8	7.9	7.2	7.8	7.6	8.5	7.2
	Conductivity (µmhos/cm)	205		217		213		212		255		214		214	
	Temperature (°C)	25.4	24.8	25.1	24.5	25.1	24.4	25.1	24.6	24.7	24.5	25.0	24.3	25.2	24.4
100%	pH (SU)	7.79	7.52	7.74	7.58	7.66	7.45	7.67	7.57	7.72	7.84	8.15	7.84	8.21	7.46
	DO (mg/L)	7.9	7.4	7.8	7.7	8.1	7.5	8.0	7.8	7.9	7.2	7.7	7.6	8.3	7.3
	Conductivity (µmhos/cm)	183		199		183		170		211		185		182	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	25.5	24.8	25.3	24.3	25.2	24.4	25.3	24.7	24.9	24.6	25.1	24.3	25.2	24.3
100% Intake	pH (SU)	7.79	7.54	7.74	7.57	7.66	7.51	7.73	7.51	7.77	7.88	8.14	7.77	8.21	7.39
	DO (mg/L)	7.9	7.4	7.9	7.7	8.1	7.5	8.2	8.1	8.2	7.3	7.9	7.6	8.3	7.4
	Conductivity (µmhos/cm)	184		200		191		175		215		174		177	
	Alkalinity (mg/L $CaCO_3$)														
	Hardness (mg/L $CaCO_3$)														
	Total Residual Chlorine (mg/L)														
	Temperature (°C)	25.1	24.6	25.3	24.4	25.2	24.5	25.1	24.8	25.0	24.6	25.0	24.3	25.1	24.3

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

Date: 02-08-05

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	7.76	7.57	7.73	7.54	7.71	7.40
	DO (mg/L)	7.8	7.6	7.8	7.6	8.0	7.5
	Conductivity (µmhos/cm)	292		312		284	
	Temperature (°C)	25.1	24.6	25.2	24.5	25.2	24.4
10.98%	pH (S.U.)	7.78	7.58	7.72	7.54	7.70	7.43
	DO (mg/L)	7.8	7.6	7.8	7.7	8.0	7.4
	Conductivity (µmhos/cm)	277		301		284	
	Temperature (°C)	25.2	24.7	25.4	24.6	25.3	24.3
22%	pH (S.U.)	7.76	7.57	7.73	7.56	7.69	7.41
	DO (mg/L)	7.8	7.6	7.8	7.6	8.1	7.4
	Conductivity (µmhos/cm)	270		290		271	
	Temperature (°C)	25.2	24.6	25.3	24.4	25.3	24.4
43.9%	pH (S.U.)	7.78	7.53	7.73	7.54	7.68	7.40
	DO (mg/L)	7.8	7.6	7.8	7.7	8.1	7.5
	Conductivity (µmhos/cm)	240		265		237	
	Temperature (°C)	25.4	24.8	25.3	24.5	25.1	24.6
72%	pH (S.U.)	7.78	7.52	7.71	7.59	7.67	7.53
	DO (mg/L)	7.8	7.5	7.8	7.7	8.1	7.5
	Conductivity (µmhos/cm)	205		217		213	
	Temperature (°C)	25.4	24.8	25.1	24.5	25.1	24.4
100%	pH (S.U.)	7.79	7.52	7.74	7.58	7.66	7.45
	DO (mg/L)	7.9	7.4	7.8	7.7	8.1	7.5
	Conductivity (µmhos/cm)	183		199		183	
	Temperature (°C)	25.5	24.8	25.3	24.3	25.2	24.4
100% Intake	pH (S.U.)	7.79	7.54	7.74	7.57	7.66	7.51
	DO (mg/L)	7.9	7.4	7.9	7.7	8.1	7.5
	Conductivity (µmhos/cm)	184		200		191	
	Temperature (°C)	25.1	24.6	25.3	24.4	25.2	24.5
		Initial	Final	Initial	Final	Initial	Final

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

Date: 02-08-05

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	KEL	KEL	CAJ
Concentration	Parameter								
ONTROL	pH (S.U.)	7.70	7.55	7.75	7.79	8.11	7.76	8.20	7.42
	DO (mg/L)	8.0	7.7	7.9	7.2	7.8	7.4	8.3	7.4
	Conductivity (µmhos/cm)	283		341		~~284~~ P 278		281	
	Temperature (°C)	25.2	24.6	24.8	24.5	24.9	24.4	24.9	24.4
10.98%	pH (S.U.)	7.68	7.52	7.73	7.79	8.12	7.75	8.20	7.41
	DO (mg/L)	8.1	7.8	8.0	7.1	7.8	7.3	8.4	7.4
	Conductivity (µmhos/cm)	279		326		272		279	
	Temperature (°C)	25.3	24.7	24.8	24.4	24.9	24.3	25.1	24.4
22%	pH (S.U.)	7.71	7.56	7.74	7.82	8.13	7.74	8.20	7.39
	DO (mg/L)	8.1	7.6	8.0	7.1	7.8	7.2	8.5	7.3
	Conductivity (µmhos/cm)	265		~~247~~ P 306		270		271	
	Temperature (°C)	25.3	24.7	24.9	24.6	25.1	24.3	25.1	24.4
43.9%	pH (S.U.)	7.72	7.56	7.74	7.80	8.14	7.74	8.21	7.38
	DO (mg/L)	8.2	7.7	7.9	7.1	7.8	7.3	8.5	7.4
	Conductivity (µmhos/cm)	244		289		243		244	
	Temperature (°C)	25.1	24.7	24.9	24.6	25.1	24.5	25.0	24.1
72%	pH (S.U.)	7.72	7.61	7.75	7.84	8.14	7.84	8.21	7.47
	DO (mg/L)	8.2	7.8	7.9	7.2	7.8	7.6	8.5	7.2
	Conductivity (µmhos/cm)	212		255		214		214	
	Temperature (°C)	25.1	24.6	24.7	24.5	25.0	24.3	25.2	24.4
100%	pH (S.U.)	7.67	7.57	7.72	7.84	8.15	7.84	8.21	7.46
	DO (mg/L)	8.0	7.8	7.9	7.2	7.7	7.6	8.3	7.3
	Conductivity (µmhos/cm)	170		211		185		102	
	Temperature (°C)	25.3	24.7	24.9	24.6	25.1	24.3	25.2	24.3
100% ntake	pH (S.U.)	7.73	7.51	7.77	7.88	8.14	7.77	8.21	7.39
	DO (mg/L)	8.2	8.1	8.2	7.3	7.9	7.6	8.3	7.4
	Conductivity (µmhos/cm)	175		215		174		177	
	Temperature (°C)	25.1	24.8	25.0	24.6	25.0	24.3	25.1	24.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst: OAJ

Date analyzed: 02-07-05

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
3.97	INR 121	INR 157	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 258	100	100	12.4	22.0	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%)
01-31-05	SSW H_2O	100	22.0	25.1	3.1	10.1	S 31	
↓	Duplicate	↓	25.1	28.2	3.1	↓	D 31	—

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 258	50	100	25.1	33.0	7.9	10.1	80

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%)
31	49	98%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
01-31-05	MHS H_2O	100	33.0	38.8	5.8	10.1	59
02-02-05	MHS H_2O	↓	38.8	44.6	5.8	↓	59
02-03-05	SSW H_2O	↓	44.6	47.8	3.2	↓	32
02-06-05	SSW H_2O	↓	5.1	8.3	3.2	↓	32
↓	MHS H_2O	↓	8.3	14.0	5.7	↓	58
02-04-05	SALT H_2O A	↓	14.0	28.4	14.4	↓	140
↓	↓ B	↓	28.4	43.3	14.9	↓	150
↓	↓ C	↓	4.6	19.1	14.5	↓	150
02-06-05	SALT H_2O	↓	19.1	33.1	14.0	↓	140

Reviewed by: [illegible]

Date reviewed: 02-07-05

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

Analyst: (A)
Date analyzed: 02-14-05

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
3.97	INR121	INR 157	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 258	100	100	12.4	22.0	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%)
02-08-05	SALT	100	22.0	36.2	14.2	10.1	S 140	
↓	Duplicate	↓	5.9	20.0	14.1	↓	D 140	—

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 258	50	100	5.9	24.8	18.9	10.1	190

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%)
140	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
02-07-05	MHS H_2O	100	24.8	31.1	6.3	10.1	64
02-10-05	MHS H_2O A	↓	31.1	37.2	6.1	↓	62
↓	↓ B		37.2	43.3	6.1		62
↓	SSW H_2O		43.3	46.8	3.5		35
02-12-05	MHS H_2O		40	10.0	6.0		61
02-13-05	MHS H_2O		10.0	16.2	6.2		63
↓	SSW H_2O		16.2	19.5	3.3		33
050208.00	OWASA 1		19.5	24.4	4.9		50
050209.00	↓ 2	↓	24.4	29.3	4.9	↓	50

Reviewed by: [illegible] Date reviewed: 02-19-05

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

Analyst: CAJ
Date analyzed: 02-14-05

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 258	100	100	29.3	39.1	9.8	10.1	99	99 %

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%)
050212.15	QWASA 3	100	39.1	44.6	5.5	10.1	S 56	
↓	Duplicate	↓	4.9	10.5	5.6	↓	D 57	1.8 %

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 258	50	100	4.9	15.5	10.6	10.1	107

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%)
57	50	100 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
050208.02	Core Pp 1	100	15.5	36.0	20.5	10.1	210
050210.02	↓ 2	↓	0.7	21.4	20.7	↓	210
050212.04	↓ 3	↓	21.4	42.5	21.1	↓	210
050208.01	Core Cd 1	↓	1.9	18.8	16.9	↓	170
050210.01	↓ 2	↓	18.8	38.6	19.8	↓	200
050212.03	↓ 3	↓	0.4	20.7	20.3	↓	200
050208.04	ENFIELD 1	↓	20.7	23.5	2.8	↓	28
050210.04	↓ 2	↓	23.5	26.0	2.5	↓	25
050212.19	↓ 3	↓	26.0	28.9	2.9	↓	29

Reviewed by: [illegible] Date reviewed: 02-19-05

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

Analyst	CAJ
Date analyzed	02-14-05

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 258	100	100	28.9	38.5	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%)
050207.01	WAYNESVILLE	100	2.0	3.4	1.4	10.1	S 14	
↓	Duplicate .1	↓	3.4	4.7	1.3	↓	D 13	7.4 %

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 258	50	100	3.4	9.6	6.2	10.1	63

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%)
13	50	100 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
050209.21	WAYNESVILLE 2	100	9.6	14.4	4.8	10.1	48
050211.01	↓ 3	↓	14.4	23.2	8.8	↓	89
050207.02	SQN 101 1		23.2	29.9	6.7		68
050209.22	↓ 2		29.9	36.5	6.6		67
050211.03	↓ 3		36.5	43.0	6.5		66
050207.03	SQN INT 1		43.0	49.7	6.7		68
050209.23	↓ 2		0.8	7.3	6.5		66
050211.04	↓ 3		7.3	14.0	6.7		68
050205.05	HATTERAS 1	↓	14.0	50.0 ~~73.7~~	58.7	↓	590

0.0

Reviewed by: [illegible] Date reviewed: 02-19-05

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

Analyst	CAJ
Date analyzed	02-14-05

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 258	100	100	22.7	32.8	10.1	10.1	102	102 %

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%)
050208.03	HATTERAS 2	250	3.0	17.2	14.2	(4) 10.1	S 570	
↓	Duplicate	↓	17.2	31.2	14.0	↓	D 570	—

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 258	200	25	17.2	36.1	18.9	(4) 10.1	760

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%)
570	190	95 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
050210.03	Hatteras ~~HATTERAS~~ 3	250	3.7	18.1	14.4	(4) 10.1	580
050205.03	HERCULES 1	100	18.1	30.0	11.9	↓	120
050208.05	↓ 2	↓	30.0	41.9	11.9	↓	120
050210.07	↓ 3	↓	35.4	46.7	11.3	↓	110

CAJ

Reviewed by: JL Date reviewed: 02-19-05

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

Analyst: CAJ
Date analyzed: 02-07-05

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 227	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%)
01-31-05	MHS H2O	50	11.9	16.0	4.1	20.2	S 83	
↓	Duplicate	↓	16.0	20.2	~~4.2~~ 4.2	↓	D 85	2.4%

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 227	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%)
85	40	100%

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
01-31-05	SSW H2O	↓	22.2	24.2	2.0	↓	40
02-02-05	MHS H2O	↓	24.2	28.4	4.2	↓	85
02-03-05	SSW H2O	↓	28.4	30.5	2.1	↓	42
02-06-05	SSW H2O	↓	30.5	32.6	2.1	↓	42
↓	MHS H2O	↓	32.6	36.6	4.0	↓	81
							CAJ

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

Reviewed by: [illegible]

Date reviewed: 02-07-05

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

Analyst	CAJ
Date analyzed	02-14-05

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
INR 125	INSS 172	0.0	9.8	9.8	0.0204	20.4

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 227	40	50	9.8	11.8	2.0	20.4	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
02-07-05	MHS H2O	50	11.8	16.0	4.2	20.4	S 86	
↓	Duplicate	↓	16.0	20.2	4.2	↓	D 86	—

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 227	40	50	16.0	22.1	6.1	20.4	124

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%)
86	38	95 %

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	20.4	ND
02-10-05	MHS H2O A	↓	22.1	26.1	4.0	↓	82
↓	↓ B		26.1	30.2	4.1		84
↓	SSW H2O		30.2	32.3	2.1		43
02-12-05	MHS H2O		32.3	36.5	4.2		86
02-13-05	MHS H2O		36.5	40.8	4.3		88
↓	SSW H2O		40.8	42.8	2.0		41
05020806	OWASA 1		0.2	2.9	2.7		55
050219.20	↓ 2		2.9	5.6	2.7		55
050212.15	↓ 3	↓	5.6	8.4	2.8	↓	57

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

Reviewed by: [signature]

Date reviewed: 02-19-05

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

Analyst	CAJ
Date analyzed	02-14-05

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 227	40	50	8.4	10.4	2.0	20.4	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050208.02	Corr Pp 1	50	10.4	21.6	11.2	20.4	S 230	
↓	Duplicate	↓	21.6	32.8	11.2	↓	D 230	—

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 227	40	50	21.6	34.7	13.1	20.4	270

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%)
230	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
050210.02	Corr Pp 2	50	34.7	45.8	11.1	20.4	230
050212.04	↓ 3	↓	6.1	17.7	11.6	↓	240
050208.01	Corr Cd 1		17.7	26.9	9.2		190
050208.01	↓ 2		26.9	37.9	11.0		220
050212.03	↓ 3		37.9	48.6	10.7		220
050208.04	ENFIELD 1		0.5	2.3	1.8		37
050210.04	↓ 2		2.3	4.1	1.8		37
050212.19	↓ 3		4.1	5.8	1.7		35
050207.01	WAYNESVILLE 1	↓	5.8	14.5	8.7	↓	180

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

Reviewed by: [illegible]

Date reviewed: 02-19-05

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

Analyst	CAJ
Date analyzed	02-14-05

~~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 227	40	50	14.5	16.5	2.0	20.4	41	102.5 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050209.21	WAYNESVILLE 2	50	16.5	26.6	10.1	20.4	S 210	
↓	Duplicate	↓	26.6	36.7	10.1	↓	D 210	—

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 227	40	50	26.6	38.7	12.1	20.4	250

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%)
210	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
050211.01	WAYNESVILLE 3	50	2.0	13.4	11.4	20.4	230
050207.02	SQN 101 1	↓	13.4	17.4	4.0	↓	82
050209.22	↓ 2		17.4	21.3	3.9		80
050211.03	↓ 3		21.3	25.1	3.8		78
050207.03	SQN INT 1		25.1	28.9	3.8		78
050209.23	↓ 2		28.9	32.8	3.9		80
050211.04	↓ 3		32.8	36.7	3.9	↓	80
	WAYNESVILLE EFF001	↓	36.7	44.1	7.4		150
							CAJ

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

Reviewed by: JI

Date reviewed: 02-19-05

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 139
Date analyzed	02-08-05	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	0.489	97.8 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050208.04	ENFIELD WWTP	NO COLOR, PARTICLES	S <0.00258	
↓	Duplicate		D <0.0009760	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0186
050208.02	CORR. McQUAY INTL Pp	NO COLOR CLEAR	<0.000529
050207.01 ~~050208.08~~	WAYNESVILLE WWTP	PALE TAN, PARTICLES	0.0876
050208.03	CAPE HATTERAS	PALE YELLOW, CLEAR	<0.00648
050208.05	HERCULES, INC.	NO COLOR, PARTICLES	<0.00294
050208.07	OWASA -cd	PALE YELLOW, PARTICLES	<0.000114
050208.06	OWASA -Pf	PALE YELLOW, PARTICLES	<0.0000262
050208.01	CORR-McQUAY Cd	NO COLOR, PARTICLES	0.000109
050207.02	SON 101	NO COLOR, FEW PARTICLES	<0.00681
050207.03	SON INTAKE	NO COLOR, FEW PARTICLES	<0.00526

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	0.498	99.6 %

Reviewed by	KGH
Date reviewed	02-08-05

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 139
Date analyzed	02-10-05	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	0.477	95.4 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050209.22	SQN - 101	PALE YELLOW,	S <0.0115	
↓	Duplicate	PARTICLES	D <0.00905	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.0164
050209.23	SQN - intake	PALE YELLOW, CLEAR	<0.00556
050209.20	OWASA	PALE YELLOW, PARTICLES	<0.000164
050209.21	Waynesville WWTP	PALE YELLOW, PARTICLES	0.292
050210.01	CORE - AL - cd	NO COLOR, CLEAR	<0.0182
050210.02	↓ - pp	NO COLOR, CLEAR	<0.00303
050210.03	Cape Hatteras	PALE YELLOW, CLEAR	<0.00214
050210.04	Enfield WWTP	NO COLOR, CLEAR	<0.000372
050210.05	S. Harris Plant	YELLOW, PARTICLES	<0.000303
050210.06	S. Harris EFE	NO COLOR, CLEAR	<0.00000805

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

050210.07 Hercules clno. LIGHT YELLOW. PARTICLES <0.00242

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	0.515	103 %

Reviewed by	dl
Date reviewed	02-10-05

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	PCB
Date analyzed	02-12-05

Iodide reagent:	INR 139
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	0.520	104.0%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050212.16	Bladenboro	No color, particles	S <0.000381	
↓	Duplicate		D <0.000317	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.000620
050211.05	Comm-Scope Inc	Pale yellow, clear	<0.00302
050212.19 050212.20	Enfield WWTP	No color, few particles	<0.000269
050212.02	Marshall SS	No color, floating particles	<0.000358
050212.23	Rockingham WWTP	Faint yellow, particles	<0.00242
050212.24	Roseboro WWTP	No color, particles	<0.00166
050212.01	Scarlett Acres MHP	Faint Black, cloudy, black particles	<0.000116
050212.17	Scotland Neck WWTP	Faint yellow, particles	<0.000224
050211.01 050211.02	Waynesville WWTP	Pale yellow, many particles	0.0288
050212.25	W. Point - Wagram	Yellow Brown, small particles	<0.000104

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%)~~
	0.50		

PCB

Reviewed by	[illegible]
Date reviewed	02-12-05

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 139
Date analyzed	02-12-05	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	0.457	91.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050212.06	Apex WWTP	No color, particles	S <0.00256	
↓	Duplicate		D <0.00174	–

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = <0.10 mg/L)		PCB
050212.07	Dynea	Yellow, cloudy	<0.00117
050212.08	Johnston Co.	No color, particles	<0.000671
050212.09	S. Cary WWTP	No color, few particles	<0.000641
050212.10	Wake Forest WWTP	No color, few particles	<0.000521
050212.11	Wilson WWTP	No color, few particles	<0.000193
050212.18	BASF	Yellow, Orange particles	<0.000208
050212.12	Ellerbe WWTP	Green, Cloudy	<0.000177
050212.05	Elementis Chem.	No color, No particles	<0.000111
050212.13	Raleigh - Reuse	No color, few particles	<0.000329

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%)
	0.50		PCB

Reviewed by	[illegible]
Date reviewed	02-12-05

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 139
Date analyzed	02 - 12 - 05	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	~~0.520~~ P 0.503	~~104.0%~~ P 100.6%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050212.14 050212.15	OWASA	No Color, particles	S <0.0000381	
↓	Duplicate		D <0.000738	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		~~<0.000620~~ PCB
050211.03	~~EAJ~~ TVA-SQN-101	No color, particles	<0.000247
050211.04	TVA SQN-INT	No color, particles	<0.000260
050212.21	TVA- JSF -001	No color, clear	<0.00235
050212.22	TVA- JSF- INT	No color, clear	<0.00164
050212.03 ~~14~~	Corr-A1 - cd	No color	<0.00128
050212.04	Corr-A1 - pp	No color	<0.000275
			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	0.480	96.0%

Reviewed by	HK
Date reviewed	02-12-05

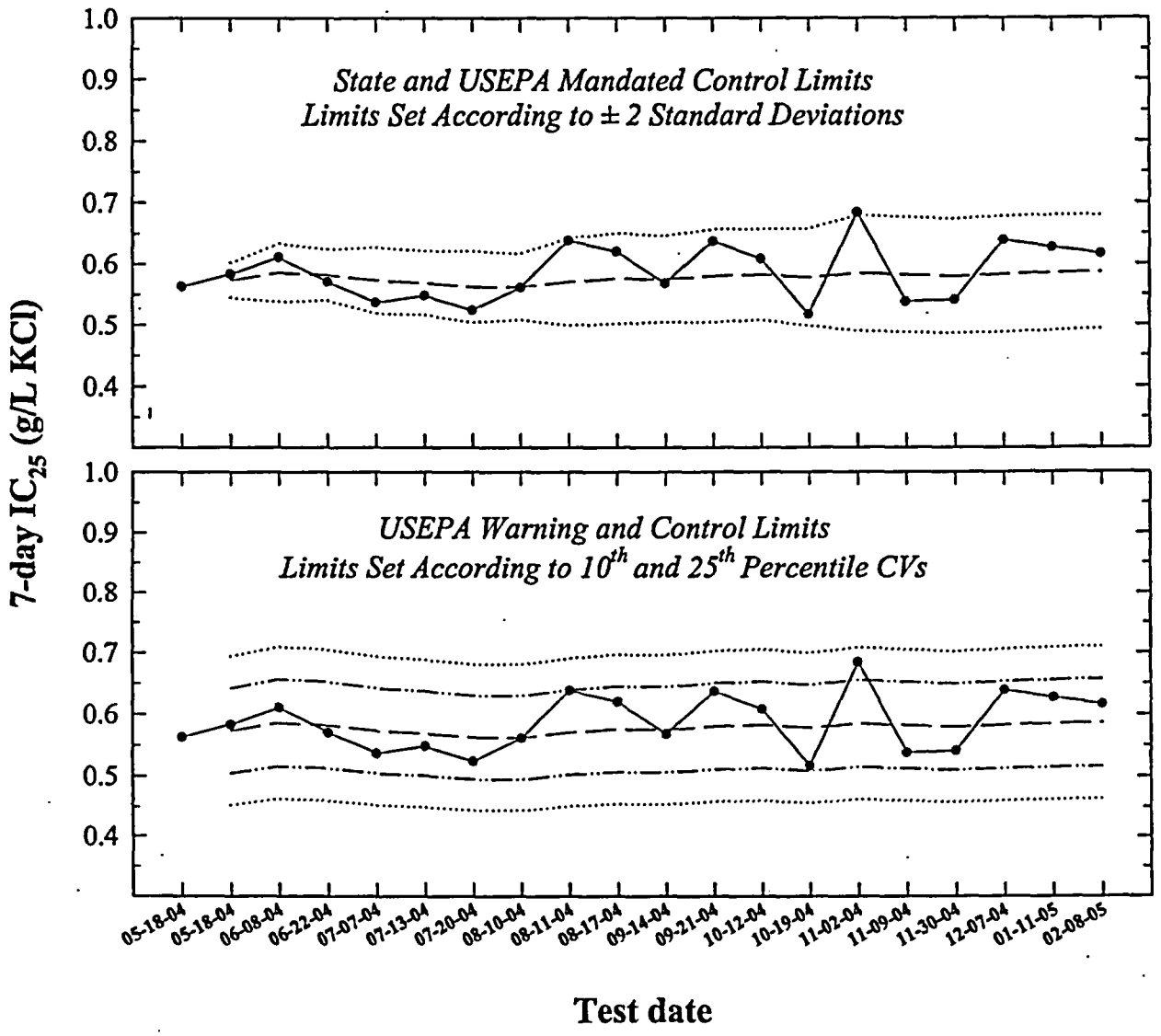
Sequoyah Nuclear Plant Biomonitoring
February 8 - 15, 2005

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	05-18-04	0.56																	
2	05-18-04	0.58	0.57	0.01	0.54	0.60	0.07	0.50	0.64	0.12	0.45	0.69	0.22	0.36	0.79	0.26	0.32	0.83	0.02
3	06-08-04	0.61	0.59	0.02	0.54	0.63	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.04
4	06-22-04	0.57	0.58	0.02	0.54	0.62	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.04
5	07-07-04	0.54	0.57	0.03	0.52	0.63	0.07	0.50	0.64	0.12	0.45	0.69	0.22	0.36	0.79	0.26	0.32	0.83	0.05
6	07-13-04	0.55	0.57	0.03	0.52	0.62	0.07	0.50	0.64	0.12	0.45	0.69	0.22	0.35	0.78	0.26	0.31	0.82	0.05
7	07-20-04	0.52	0.56	0.03	0.50	0.62	0.07	0.49	0.63	0.12	0.44	0.68	0.21	0.35	0.78	0.25	0.31	0.82	0.05
8	08-10-04	0.56	0.56	0.03	0.51	0.62	0.07	0.49	0.63	0.12	0.44	0.68	0.21	0.35	0.78	0.25	0.31	0.82	0.05
9	08-11-04	0.64	0.57	0.04	0.50	0.64	0.07	0.50	0.64	0.12	0.45	0.69	0.22	0.35	0.79	0.26	0.31	0.83	0.06
10	08-17-04	0.62	0.58	0.04	0.50	0.65	0.07	0.51	0.64	0.12	0.45	0.70	0.22	0.36	0.79	0.26	0.32	0.83	0.06
11	09-14-04	0.57	0.57	0.04	0.50	0.65	0.07	0.51	0.64	0.12	0.45	0.70	0.22	0.36	0.79	0.26	0.32	0.83	0.06
12	09-21-04	0.64	0.58	0.04	0.50	0.66	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.07
13	10-12-04	0.61	0.58	0.04	0.51	0.66	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.06
14	10-19-04	0.52	0.58	0.04	0.50	0.66	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.07
15	11-02-04	0.68	0.58	0.05	0.49	0.68	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.08
16	11-09-04	0.54	0.58	0.05	0.49	0.68	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.08
17	11-30-04	0.54	0.58	0.05	0.49	0.67	0.07	0.51	0.65	0.12	0.46	0.70	0.22	0.36	0.80	0.26	0.32	0.84	0.08
18	12-07-04	0.64	0.58	0.05	0.49	0.68	0.07	0.51	0.65	0.12	0.46	0.71	0.22	0.36	0.80	0.26	0.32	0.84	0.08
19	01-11-05	0.63	0.59	0.05	0.49	0.68	0.07	0.51	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.08
20	02-08-05	0.62	0.59	0.05	0.49	0.68	0.07	0.52	0.66	0.12	0.46	0.71	0.22	0.36	0.81	0.26	0.32	0.85	0.08

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)

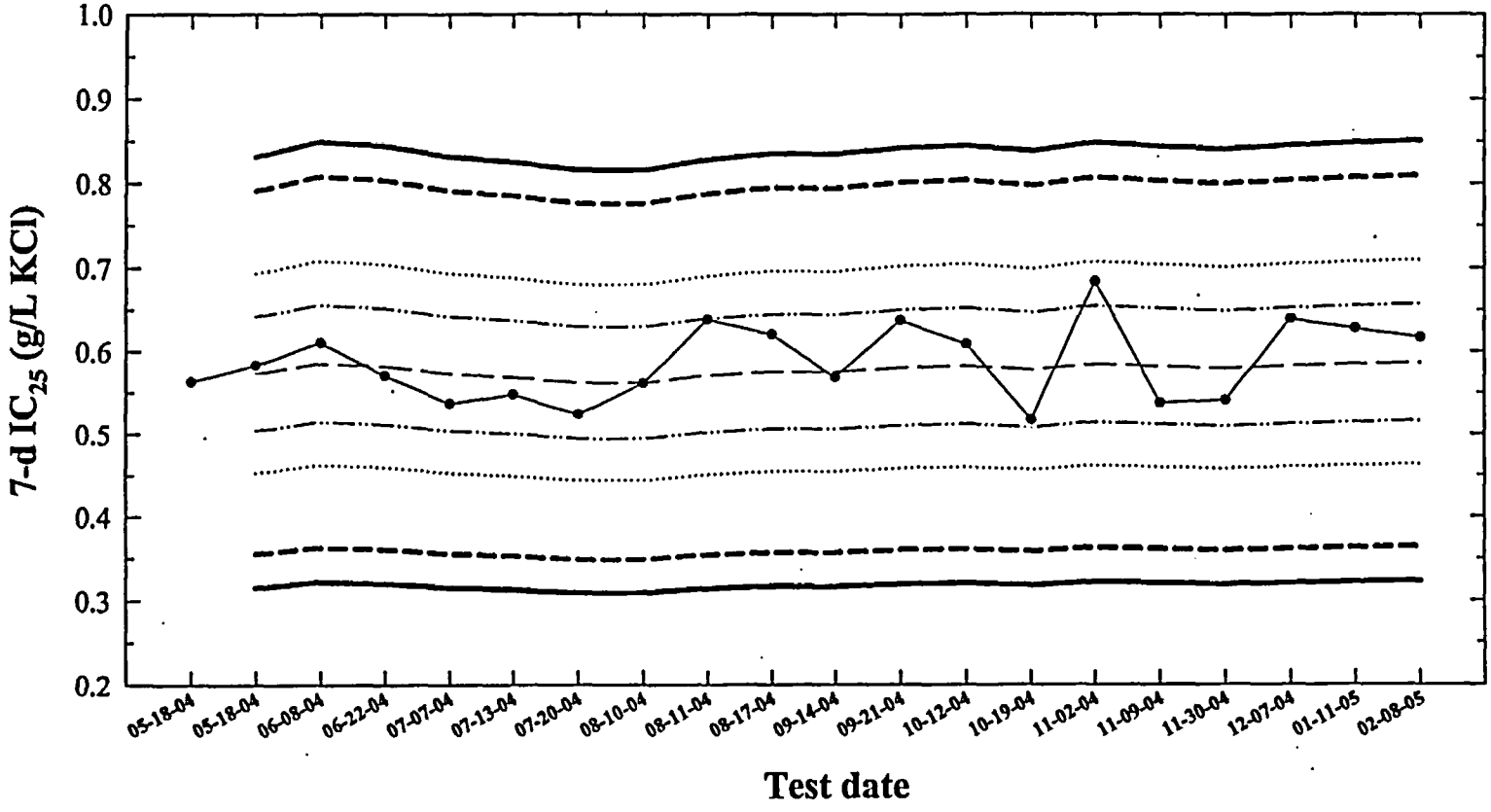
CV = Coefficient of variation of the IC_{25} values.

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

st 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	05-18-04	100	0.718		4.4		0.08	10.5	
2	05-18-04	100	0.681	0.699	9.3	6.9	0.12	17.8	14.1
3	06-08-04	100	0.859	0.753	1.3	5.0	0.08	9.6	12.6
4	06-22-04	100	0.700	0.739	15.1	7.5	0.12	16.8	13.7
5	07-07-04	100	0.610	0.714	11.1	8.3	0.08	13.6	13.6
6	07-13-04	100	0.805	0.729	10.2	8.6	0.12	15.4	13.9
7	07-20-04	100	0.727	0.728	15.6	9.6	0.17	23.4	15.3
8	08-10-04	100	0.490	0.699	11.6	9.8	0.07	14.7	15.2
9	08-11-04	100	0.673	0.696	3.6	9.1	0.12	18.4	15.6
10	08-17-04	100	0.682	0.694	7.4	9.0	0.10	14.4	15.5
11	09-14-04	100	0.825	0.706	12.9	9.3	0.13	15.4	15.4
12	09-21-04	97.5	0.700	0.706	15.8	9.9	0.12	16.4	15.5
13	10-12-04	100	0.759	0.710	12.9	10.1	0.17	22.1	16.0
14	10-19-04	100	0.757	0.713	1.1	9.5	0.09	12.3	15.8
15	11-02-04	100	0.756	0.716	10.9	9.6	0.15	19.3	16.0
16	11-09-04	100	0.609	0.709	7.8	9.4	0.11	18.0	16.1
17	11-30-04	100	0.689	0.708	15.7	9.8	0.10	15.1	16.1
18	12-07-04	97.5	0.687	0.707	7.6	9.7	0.09	12.7	15.9
19	01-11-05	100	0.797	0.712	8.7	9.6	0.10	13.0	15.7
20	02-08-05	97.5	0.687	0.710	3.9	9.3	0.11	15.5	15.7

Note: CV = Coefficient of variation for control growth.
On average, the CV for control growth is 9.3% 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 15.7% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

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

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

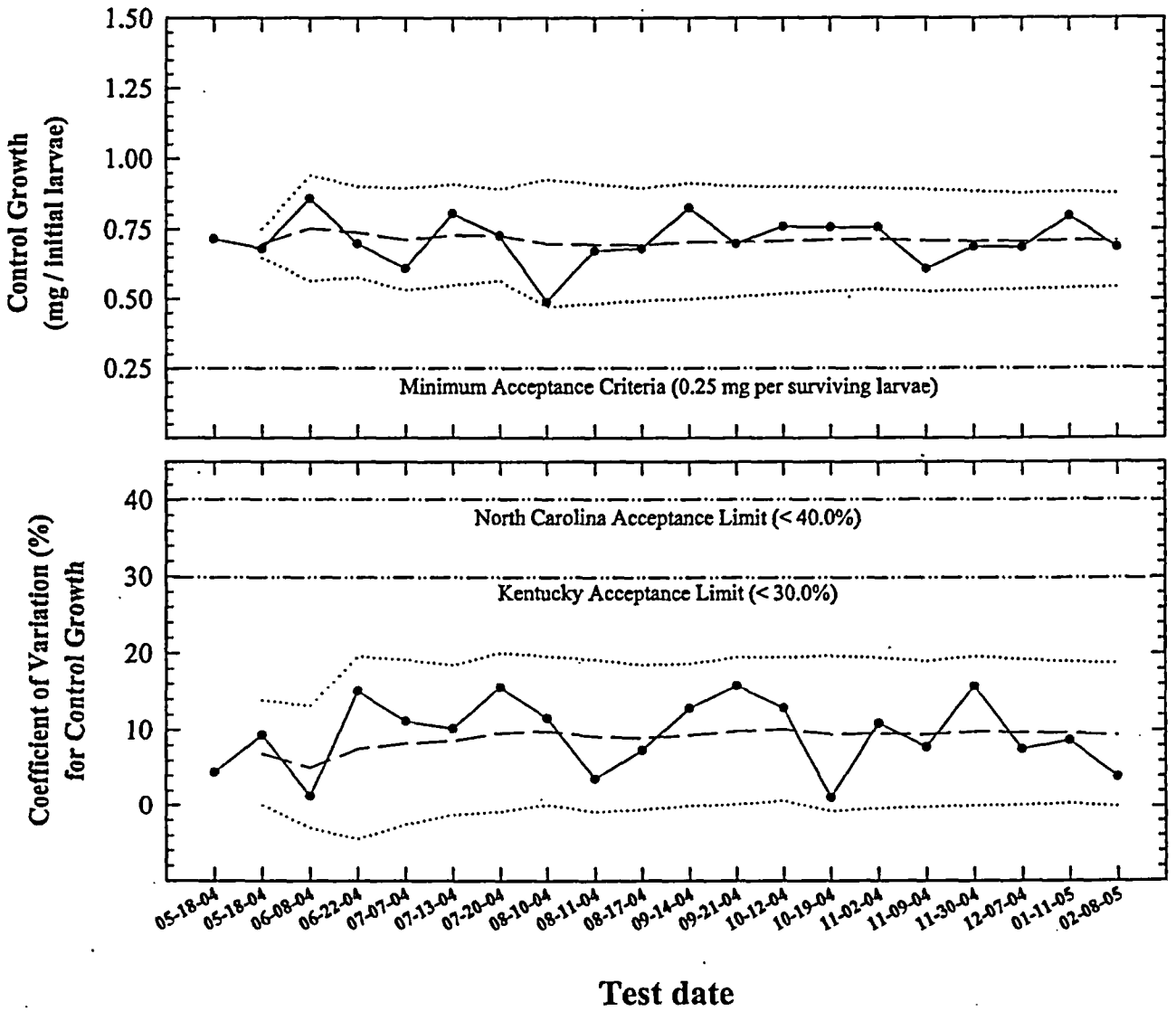
PA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. -833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatic BioSystems, Inc.

02-08-05

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)**

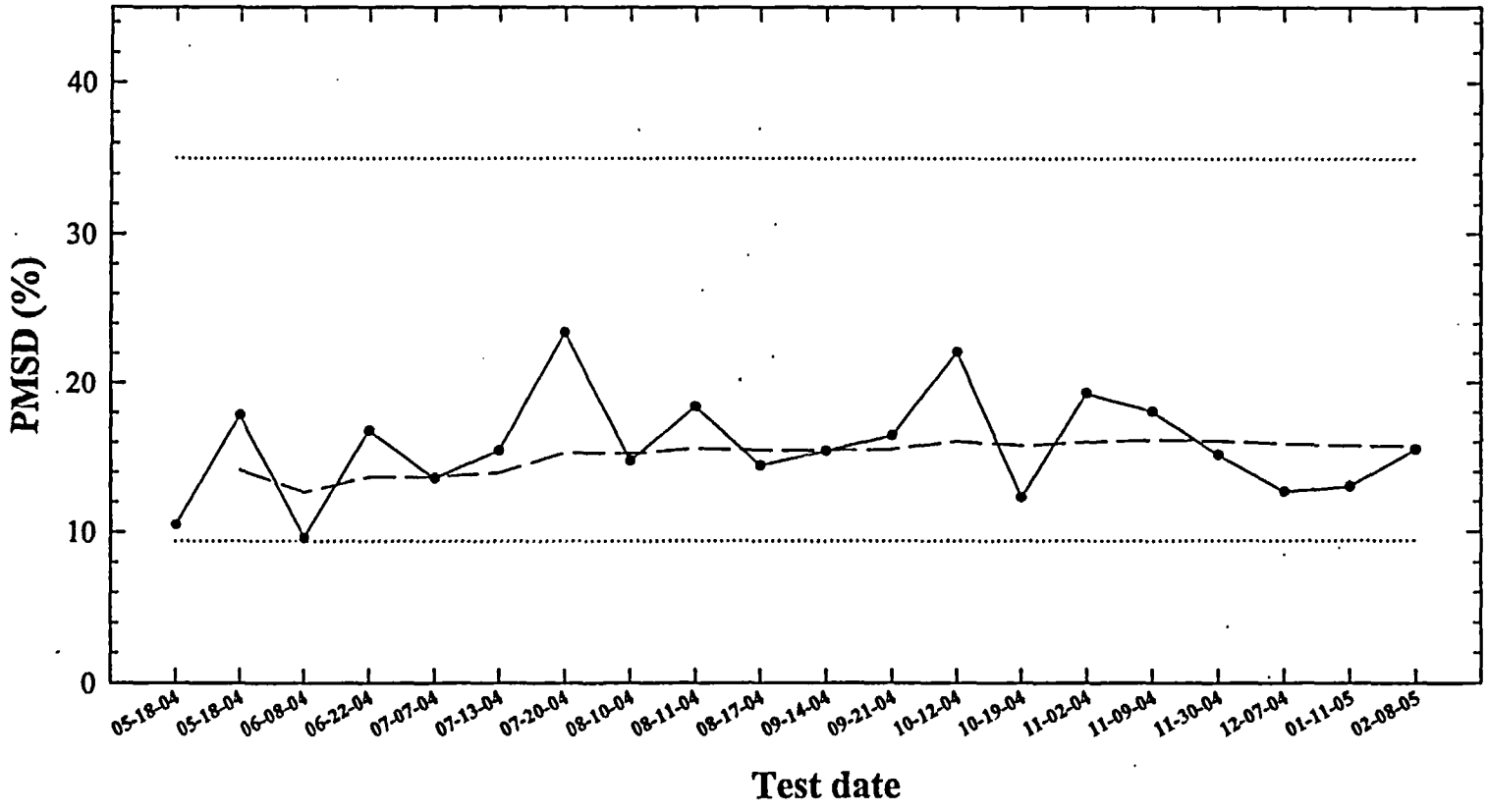
— — **Central Tendency** (mean Control Growth or CV)

····· **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: 53

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM 162					
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:	22.75 TO 25.75 HOURS OLD	Randomizing template:	WHITE
Date and times organisms were born between:	02-07-05 1300 TO 1600	Incubator number and shelf location:	2F
Organism source:	ABS BATCH 02-07-05	*Artemia* lot number:	BG10055
Transfer bowl information:	pH = 7.62 SU Temperature = 24.3 °C	Total drying time:	24 HOURS
		Date / Time in: 02-15-05	1415
Average transfer volume:	9.5 ml	Date / Time out: 02-16-05	1420
		Oven temperature:	61°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Analyst
0	02-08-05	—	1450	1441	02-06-05	JI
1	02-09-05	0932	1530	1419	02-06-05	JI
2	02-10-05	0930	1534	1444	02-07-05	JI
3	02-11-05	0925	1530	1450	02-07-05	JI
4	02-12-05	0920	1533	1430	02-10-05 B	JI KEK
5	02-13-05	0930	1533	1440	02-10-05 B	KEK
6	02-14-05	0921	1600	1435	02-12-05	KEK
7	02-15-05	—	—	1409	—	JI

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC_{50}	754.2
Average weight per initial larvae:	0.687		NOEC	450
Average weight per surviving larvae:	0.706	≥ 0.25 mg/larvae	LOEC	600
			ChV	519.6
			IC_{25}	616.4

Species: *Pimephales promelas* PpKClCR Test Number: 53

Survival and Growth Data

Day	Control				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	9 fd	10	10	10	10	10	10	10	10	10	10
7	10	1LG 9	10	10	10	10	2SM 10	1SM 10	10	10	10	10
A = Pan weight (mg) Tray color code:: Red Analyst: PCB	14.49	15.05	14.63	14.79	15.35	15.50	14.97	14.55	14.63	14.55	14.71	15.13
B = Pan + Larvae weight (mg) Analyst: JS	21.53	21.95	21.68	21.27	22.07	22.67	20.40	20.53	21.75	20.33	20.50	21.81
Larvae weight (mg) = A – B	7.04	6.90	7.05	6.48	6.72	7.17	5.43	5.98	7.12	5.78	5.79	6.63
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.704	0.690	0.705	0.648	0.672	0.717	0.543	0.598	0.712	0.578	0.579	0.663
Average weight per initial number of larvae (mg)	0.687				0.633				0.633			
Percent reduction from control (%)							7.9%				7.8%	

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: JS

Comments:

Species: *Pimephales promelas* PpKClCR Test Number: 53

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	9 1d	9 1d	9 1d	9 1d	9 1d	8 2d	7 3d	6 4d	8 2d	8 2d
2	9 1d	9 1d	9	9	7 2d	8 1d	7 2d	6 2d	3 4d	5 4	4 4d	4 4d
3	9	9	8 1d	9	7	6 2d	6 1d	5 1d	2 1d	3 2d	3 1d	4
4	9	9	8	9	7	6	6	5	2	3	2 1d	4
5	9	8 1d	7 1d	9	7	6	6	5	0 2d	3	2	3 1d
6	9	8	7	9	7	6	6	5	0	3	1 1d	3
7	9	26 7 1d	7	8 1d	7	6	6	5	0	26 3	1	3
A = Pan weight (mg) Tray color code:: Red Analyst: PCB	14.57	14.92	14.85	14.89	14.54	14.61	14.73	14.54	14.65 14.80	14.69	14.97	14.70
B = Pan + Larvae weight (mg) Analyst:	20.62	20.60	19.09	20.42	18.56	17.87	18.11	17.15	—	16.94	15.50	16.69
Larvae weight (mg) = A – B	0.605	0.568	4.24	5.53	4.02	3.26	3.38	2.61	0	2.25	0.53	1.99
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.605	0.568	0.424	0.553	0.402	0.326	0.338	0.261	0	0.225	0.053	0.199
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.537		21.7%		0.332		51.7%		0.119		82.6%	

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:

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: PpKCICR # 93 (#53 at 351 Depot St.)

Test date: February 8-15, 2005

Reviewed by: Hunter

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	14.49	21.53	7.04	0.704	0.706	6.9	0.704	97.5	0.687	3.9	Not applicable
	B	10	9	15.05	21.95	6.90	0.767			0.690				
	C	10	10	14.63	21.68	7.05	0.705			0.705				
	D	10	10	14.79	21.27	6.48	0.648			0.648				
300	E	10	10	15.35	22.07	6.72	0.672	0.633	12.2	0.672	100.0	0.633	12.2	7.9
	F	10	10	15.50	22.67	7.17	0.717			0.717				
	G	10	10	14.97	20.40	5.43	0.543			0.543				
	H	10	10	14.55	20.53	5.98	0.598			0.598				
450	I	10	10	14.63	21.75	7.12	0.712	0.633	10.4	0.712	100.0	0.633	10.4	7.8
	J	10	10	14.55	20.33	5.78	0.578			0.578				
	K	10	10	14.71	20.50	5.79	0.579			0.579				
	L	10	10	15.18	21.81	6.63	0.663			0.663				
600	M	10	9	14.57	20.62	6.05	0.672	0.695	12.4	0.605	77.5	0.537	14.7	21.7
	N	10	7	14.92	20.60	5.68	0.811			0.568				
	O	10	7	14.85	19.09	4.24	0.605			0.424				
	P	10	8	14.89	20.42	5.53	0.691			0.553				
750	Q	10	7	14.54	18.56	4.02	0.574	0.551	4.2	0.402	60.0	0.332	17.4	51.7
	R	10	6	14.61	17.87	3.26	0.543			0.326				
	S	10	6	14.73	18.11	3.38	0.563			0.338				
	T	10	5	14.54	17.15	2.61	0.522			0.261				
900	U	10	0	0.00	0.00	0.00	0.000	0.648	17.1	0.000	17.5	0.119	92.1	82.6
	V	10	3	14.69	16.94	2.25	0.750			0.225				
	W	10	1	14.97	15.50	0.53	0.530			0.053				
	X	10	3	14.70	16.69	1.99	0.663			0.199				

Dunnett's MSD value: 0.1063

PMSD: 15.5

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 15.7% from the control (determined through reference toxicant testing).

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

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

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

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

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	2/1/2005	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	2/15/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
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	0.9000	1.0000	1.0000
300	1.0000	1.0000	1.0000	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	0.9000	0.7000	0.7000	0.8000
750	0.7000	0.6000	0.6000	0.5000
900	0.0000	0.3000	0.1000	0.3000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4			1	40
300	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
450	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00	0	40
600	0.7750	0.7949	1.0846	0.9912	1.2490	11.294	4	10.50	10.00	9	40
*750	0.6000	0.6154	0.8872	0.7854	0.9912	9.469	4	10.00	10.00	16	40
*900	0.1750	0.1795	0.4100	0.1588	0.5796	50.476	4	10.00	10.00	33	40

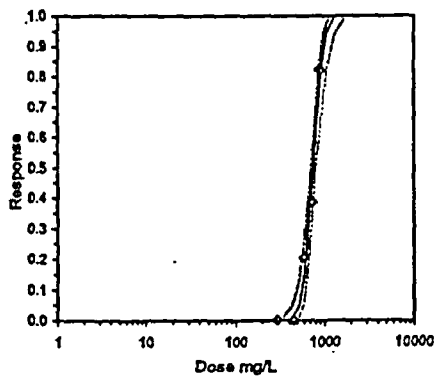
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.907154143	0.884	-0.28902293	1.131502896
Equality of variance cannot be confirmed				

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

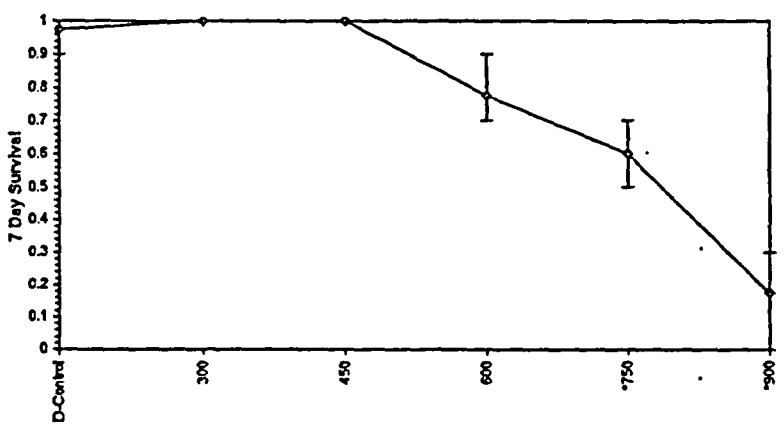
Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	10.35701873	1.755412766	6.91640964	13.79762781	0.025	4.179123377	7.814727783	0.24	2.877499507	0.096552881	7
Intercept	-24.8023163	5.039534534	-34.6798042	-14.9248284							
TSCR	0.009137572	0.010006611	-0.01047539	0.028750531							

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	449.6596479	345.9492586	515.1547081
EC05	3.355	523.2197752	432.5082959	579.2695757
EC10	3.718	567.2336838	486.529472	617.4820337
EC15	3.964	599.0028397	526.1958343	645.3441972
EC20	4.158	625.5161895	559.4724111	669.0306981
EC25	4.326	649.1956165	589.0880242	690.7518672
EC40	4.747	712.9155964	665.9826075	754.1410182
EC50	5.000	754.2225429	711.3186871	801.3878118
EC60	5.253	797.9228581	754.3014312	857.7357874
EC75	5.674	876.2407294	821.6995503	971.8485371
EC80	5.842	909.4115496	847.9710873	1023.783538
EC85	6.036	949.6643738	878.7559766	1088.947186
EC90	6.282	1002.852335	918.1162952	1178.101459
EC95	6.645	1087.213545	978.4101491	1325.616076
EC99	7.326	1265.071677	1099.910896	1657.701728



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

02-08-05

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/8/2005	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	2/15/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.7040	0.6900	0.7050	0.6480
300	0.6720	0.7170	0.5430	0.5980
450	0.7120	0.5780	0.5790	0.6630
600	0.6050	0.5680	0.4240	0.5530
750	0.4020	0.3260	0.3380	0.2610
900	0.0000	0.2250	0.0530	0.1990

			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	0.6868	1.0000	0.6868	0.6480	0.7050	3.892	4				0.6868	1.0000
300	0.6325	0.9210	0.6325	0.5430	0.7170	12.213	4	1.168	2.290	0.1063	0.6328	0.9214
450	0.6330	0.9217	0.6330	0.5780	0.7120	10.432	4	1.158	2.290	0.1063	0.6328	0.9214
*600	0.5375	0.7827	0.5375	0.4240	0.6050	14.653	4	3.215	2.290	0.1063	0.5375	0.7827
750	0.3318	0.4831	0.3318	0.2610	0.4020	17.414	4				0.3318	0.4831
900	0.1193	0.1736	0.1193	0.0000	0.2250	92.056	4				0.1193	0.1736

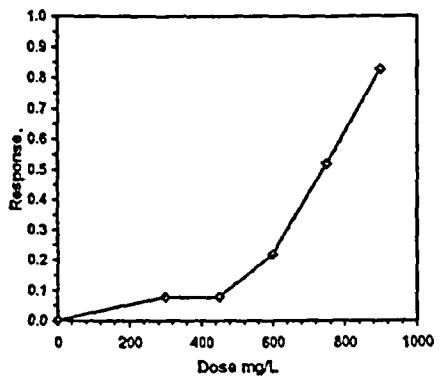
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.952488899	0.844	-0.40106587	-0.63906581
Bartlett's Test indicates equal variances (p = 0.41)	2.891007662	11.34486675		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	600	519.6152423		0.106321484	0.154818325	0.015417729	0.004311229	0.046920247	3, 12
Treatments vs D-Control										

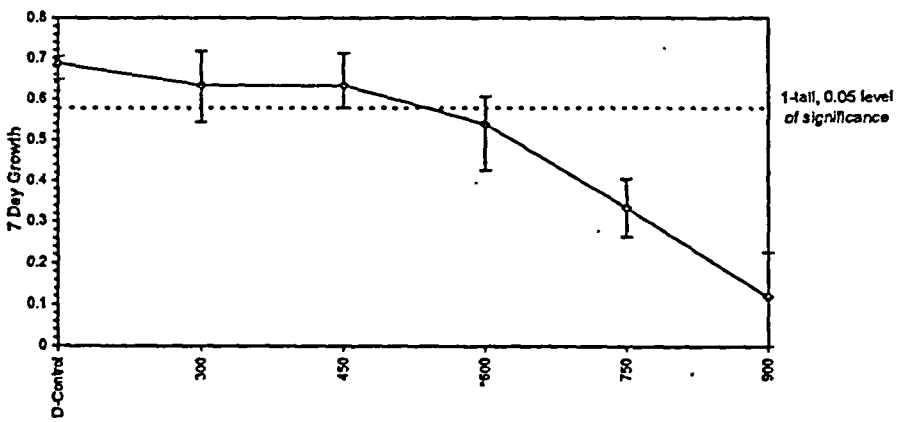
Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	190.76	115.23	51.61	633.25	0.6529
IC10	473.11	100.83	48.27	556.90	-0.9349
IC15	527.19	61.03	230.12	654.70	-1.5762
IC20	581.26	36.65	452.43	655.79	-0.6506
IC25	616.36	28.08	490.70	667.78	-1.2383
IC40	691.46	16.95	630.43	739.88	-0.5338
IC50	741.52	16.05	694.93	792.21	-0.0177

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

Species: *Pimephales promelas* PpKClCR Test Number: 53

Daily Chemistry:

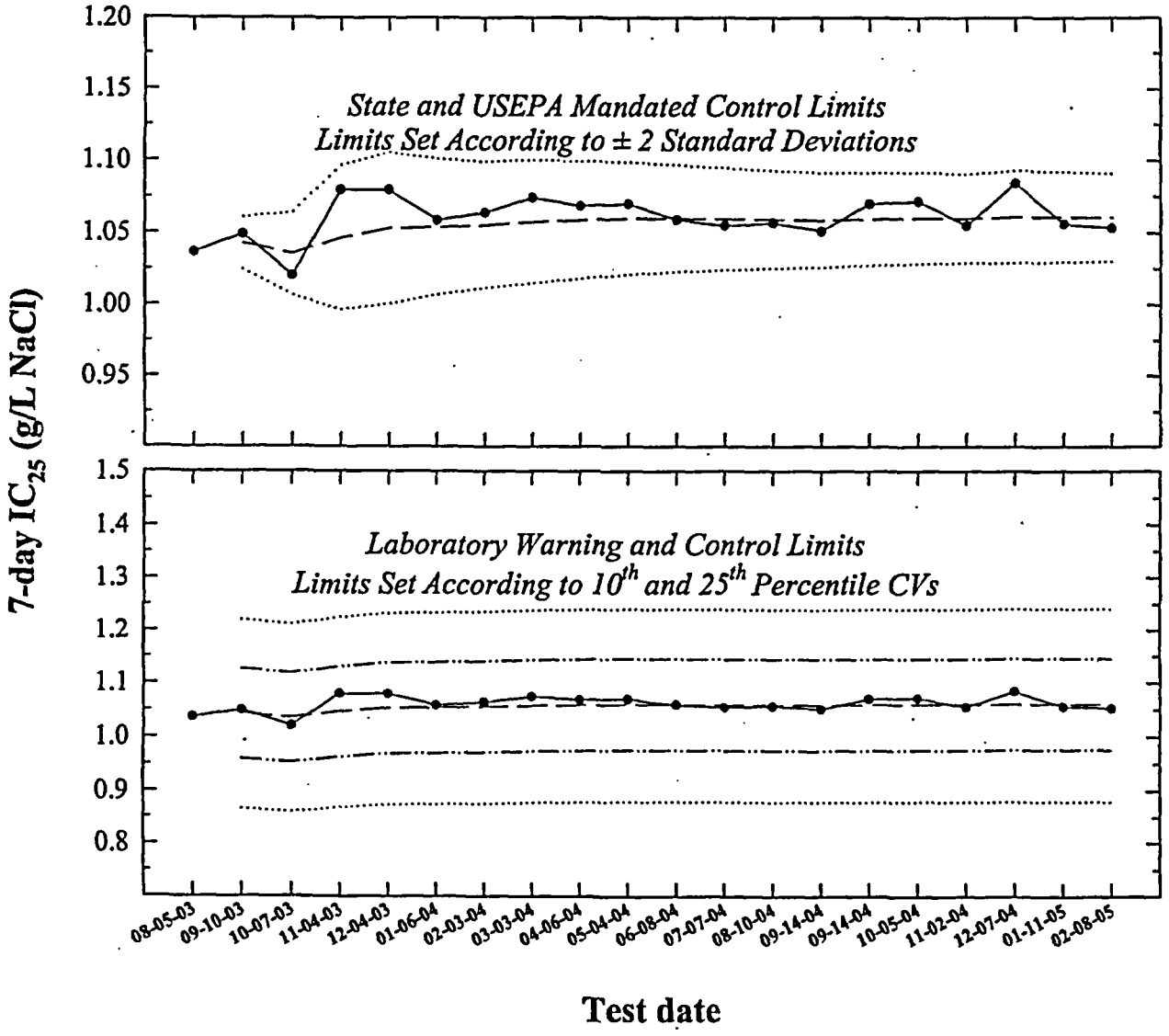
		Day					
		0		1		2	
	Analyst	CAJ	CAJ	CAJ	CAJ	CAJ	CAJ
Concentration	Parameter						
CONTROL	pH (S.U.)	7.86	7.69	7.86	7.45	7.66	7.58
	DO (mg/L)	7.7	7.6	7.8	7.6	7.8	7.6
	Conductivity (µmhos/cm)	303		308		295	
	Alkalinity (mg $CaCO_3$/L)	58				64	
	Hardness (mg $CaCO_3$/L)	81				86	
	Temperature (°C)	25.3	24.7	25.4	24.6	25.2	24.7
300 mg KCl/L	pH (S.U.)	7.86	7.69	7.89	7.53	7.73	7.60
	DO (mg/L)	7.7	7.6	7.8	7.6	7.9	7.6
	Conductivity (µmhos/cm)	813		894		808	
	Temperature (°C)	25.2	24.9	25.2	24.5	25.1	24.4
450 mg KCl/L	pH (S.U.)	7.88	7.70	7.89	7.54	7.76	7.59
	DO (mg/L)	7.7	7.7	7.8	7.7	7.8	7.6
	Conductivity (µmhos/cm)	1140		1200		1180	
	Temperature (°C)	25.0	24.8	25.2	24.5	25.1	24.4
600 mg KCl/L	pH (S.U.)	7.90	7.71	7.89	7.58	7.77	7.59
	DO (mg/L)	7.7	7.6	7.8	7.7	7.9	7.5
	Conductivity (µmhos/cm)	1430		1490		1440	
	Temperature (°C)	25.2	24.9	25.3	24.5	25.3	24.5
750 mg KCl/L	pH (S.U.)	7.90	7.71	7.90	7.63	7.77	7.63
	DO (mg/L)	7.7	7.6	7.9	7.7	7.9	7.5
	Conductivity (µmhos/cm)	1700		1900		1750	
	Temperature (°C)	25.2	24.7	25.3	24.7	25.2	24.5
900 mg KCl/L	pH (S.U.)	7.90	7.70	7.90	7.59	7.77	7.58
	DO (mg/L)	7.7	7.6	7.9	7.8	7.9	7.5
	Conductivity (µmhos/cm)	1960		2280		2000	
	Temperature (°C)	25.4	24.7	25.3	24.5	25.2	24.5
STOCK	Conductivity (µmhos/cm)	78500				76400	
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* PpKClCR Test Number: 53

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	MEL	MEL	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	7.82	7.36	7.80	7.81	7.96	7.65	8.11	7.50
	DO (mg/L)	7.8	7.4	7.7	7.2	7.7	7.2	7.8	7.0
	Conductivity (µmhos/cm)	283		307		282		289	
	Alkalinity (mg $CaCO_3$/L)			62				61	
	Hardness (mg $CaCO_3$/L)			84				86	
	Temperature (°C)	25.3	24.6	25.1	24.6	24.9	24.3	24.7	24.3
300 mg KCl/L	pH (S.U.)	7.85	7.39	7.83	7.62	8.10	7.64	8.17	7.44
	DO (mg/L)	7.9	7.4	7.8	7.1	7.8	7.3	7.8	7.0
	Conductivity (µmhos/cm)	794		850		777		903	
	Temperature (°C)	25.2	24.6	24.9	24.3	24.8	24.5	24.9	24.3
450 mg KCl/L	pH (S.U.)	7.85	7.39	7.85	7.67	8.08	7.65	8.17	7.52
	DO (mg/L)	7.9	7.3	7.7	7.2	7.9	7.4	7.8	7.0
	Conductivity (µmhos/cm)	1130		(1150) ~~1390~~		1050		1180	
	Temperature (°C)	25.2	24.6	24.9	24.7	24.8	24.5	25.0	24.4
600 mg KCl/L	pH (S.U.)	7.85	7.45	7.87	7.68	8.07	7.65	8.20	7.49
	DO (mg/L)	8.0	7.5	7.8	7.1	7.8	7.0	7.9	7.1
	Conductivity (µmhos/cm)	1420		1420		1330		1480	
	Temperature (°C)	25.4	24.5	25.0	24.5	24.9	24.4	25.0	24.4
750 mg KCl/L	pH (S.U.)	7.85	7.50	7.88	7.71	8.07	7.68	8.12	7.59
	DO (mg/L)	8.0	7.6	7.8	7.1	7.9	7.0	7.9	7.1
	Conductivity (µmhos/cm)	(1690) ~~1450~~		1700		1650		1900	
	Temperature (°C)	25.2	24.6	24.8	24.4	24.8	24.5	24.9	24.3
900 mg KCl/L	pH (S.U.)	7.85	7.53	7.89	7.75	8.09	7.76	8.19	7.55
	DO (mg/L)	7.9	7.6	7.7	7.2	7.8	7.1	7.9	7.2
	Conductivity (µmhos/cm)	1950		1990		1920		2120	
	Temperature (°C)	25.2	24.5	24.9	24.4	24.9	24.5	24.9	24.4
STOCK	Conductivity (µmhos/cm)					76100		81400	
		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	CT + 2S	S_{A10}	Laboratory Warning Limits CT - S_{A10}	CT + S_{A10}	S_{A25}	Laboratory Control Limits CT - S_{A25}	CT + S_{A25}	S_{A75}	USEPA Warning Limits CT - S_{A75}	CT + S_{A75}	S_{A90}	USEPA Control Limits CT - S_{A90}	CT + S_{A90}	CV
1	08-05-03	1.04																	
2	09-10-03	1.05	1.04	0.01	1.02	1.06	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.57	1.51	0.65	0.40	1.69	0.01
3	10-07-03	1.02	1.04	0.01	1.01	1.06	0.08	0.95	1.12	0.18	0.86	1.21	0.47	0.57	1.50	0.64	0.39	1.68	0.01
4	11-04-03	1.08	1.05	0.02	1.00	1.10	0.08	0.96	1.13	0.18	0.87	1.22	0.47	0.58	1.52	0.65	0.40	1.69	0.02
5	12-04-03	1.08	1.05	0.03	1.00	1.11	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
6	01-06-04	1.06	1.05	0.02	1.01	1.10	0.08	0.97	1.14	0.18	0.87	1.23	0.47	0.58	1.53	0.65	0.40	1.71	0.02
7	02-03-04	1.06	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
8	03-03-04	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
9	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	1.54	0.66	0.40	1.72	0.02
10	05-04-04	1.07	1.06	0.02	1.02	1.10	0.08	0.98	1.14	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.02
11	06-08-04	1.06	1.06	0.02	1.02	1.10	0.08	0.98	1.14	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.02
12	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	1.54	0.66	0.40	1.72	0.02
13	08-10-04	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	1.54	0.66	0.40	1.72	0.02
14	09-14-04	1.05	1.06	0.02	1.03	1.09	0.08	0.97	1.14	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.02
15	09-14-04	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	1.54	0.66	0.40	1.72	0.02
16	10-05-04	1.07	1.06	0.02	1.03	1.09	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
17	11-02-04	1.06	1.06	0.02	1.03	1.09	0.08	0.98	1.14	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
18	12-07-04	1.08	1.06	0.02	1.03	1.09	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.02
19	01-11-05	1.06	1.06	0.02	1.03	1.09	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
20	02-08-05	1.05	1.06	0.02	1.03	1.09	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01

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)

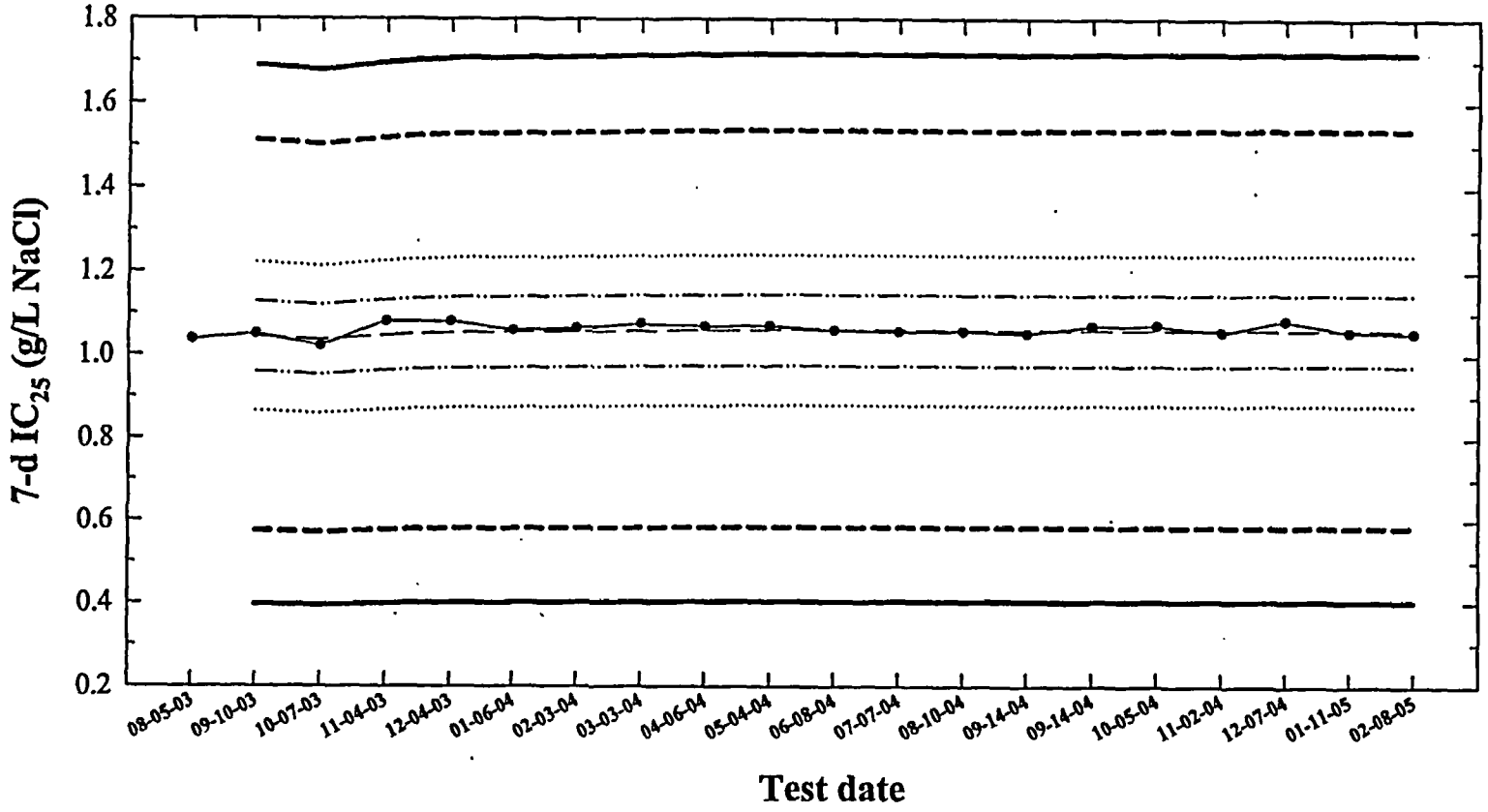
S_{A90} = Standard deviation corresponding to the 90th percentile CV. (S_{A90} = 0.62)

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	08-05-03	100	33.3		6.6		4.7	14.1	
2	09-10-03	100	29.3	31.3	4.3	5.5	3.1	10.7	12.4
3	10-07-03	100	33.4	32.0	8.0	6.3	3.2	9.5	11.4
4	11-04-03	100	31.0	31.8	7.3	6.6	2.6	8.3	10.6
5	12-04-03	100	30.4	31.5	9.7	7.2	3.6	11.8	10.9
6	01-06-04	100	30.6	31.3	4.4	6.7	3.5	11.5	11.0
7	02-03-04	100	30.7	31.2	7.2	6.8	2.7	8.8	10.7
8	03-03-04	100	29.0	31.0	7.8	6.9	3.0	10.3	10.6
9	04-06-04	100	28.1	30.6	6.2	6.8	2.8	10.0	10.6
10	05-04-04	100	32.5	30.8	6.4	6.8	3.3	10.1	10.5
11	06-08-04	100	32.9	31.0	6.8	6.8	3.0	9.0	10.4
12	07-07-04	100	33.3	31.2	6.3	6.7	2.6	7.8	10.2
13	08-10-04	100	27.4	30.9	5.8	6.7	2.3	8.6	10.0
14	09-14-04	100	28.7	30.8	4.9	6.5	2.4	8.2	9.9
15	09-14-04	100	28.8	30.6	7.5	6.6	3.0	10.5	9.9
16	10-05-04	100	29.6	30.6	8.2	6.7	2.8	9.6	9.9
17	11-02-04	100	30.5	30.6	8.5	6.8	2.7	8.8	9.9
18	12-07-04	100	31.8	30.6	4.9	6.7	2.5	7.9	9.8
19	01-11-05	100	31.0	30.6	9.4	6.8	3.1	10.0	9.8
20	02-08-05	100	30.0	30.6	6.8	6.8	2.4	8.0	9.7

Note:

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 6.8% 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 9.7% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

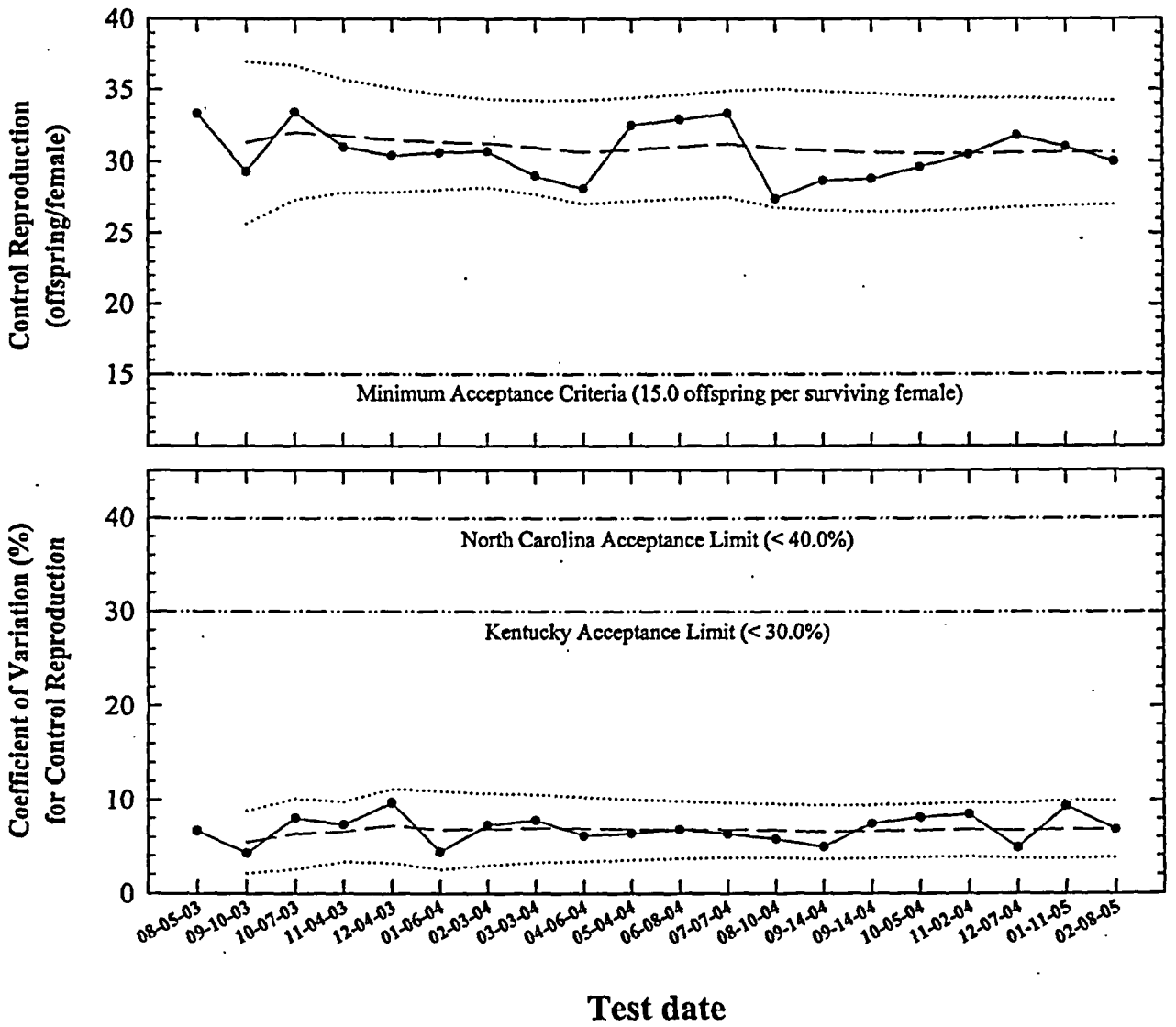
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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



Test date

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

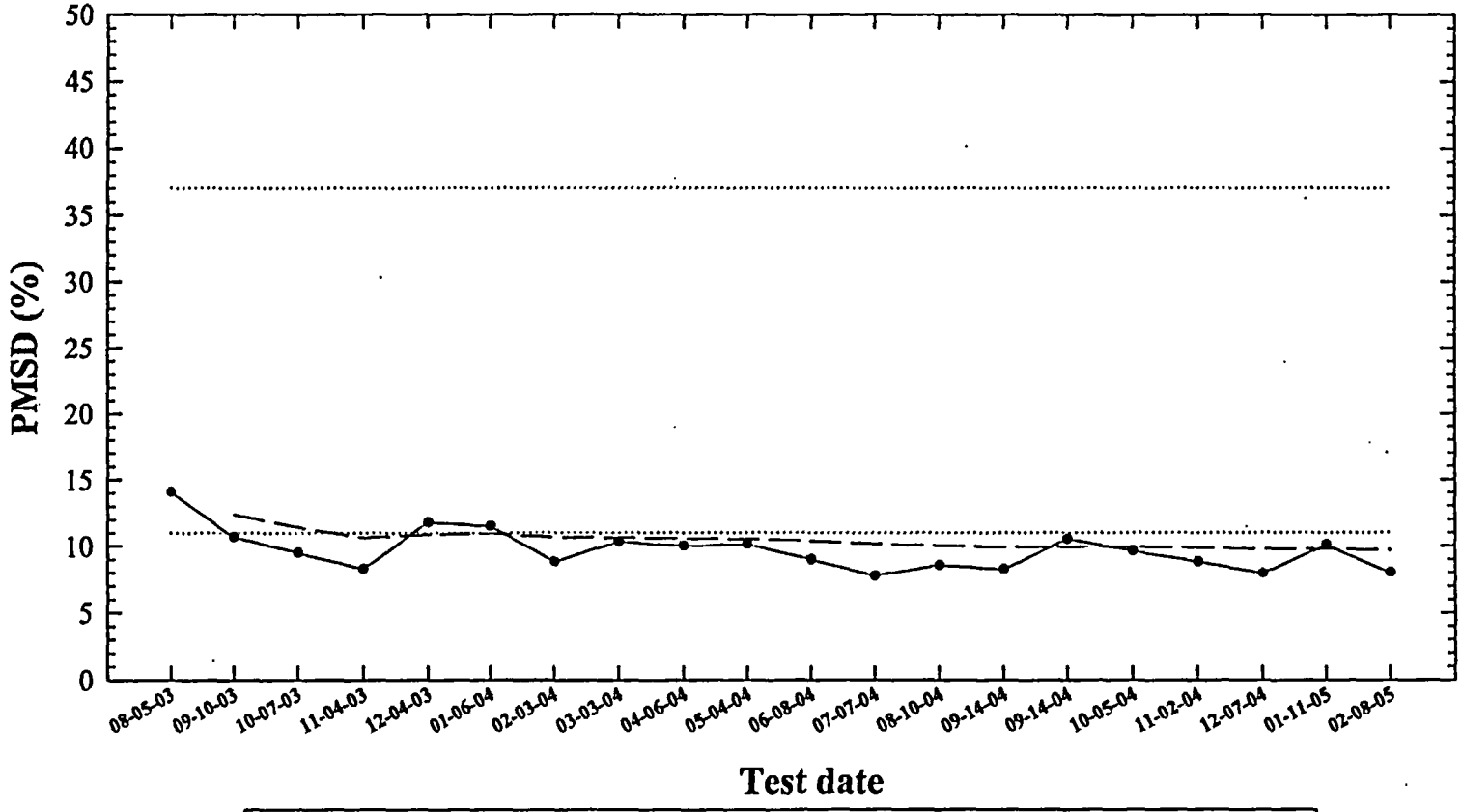
— — **Central Tendency** (mean Control Reproduction or CV)

····· **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 #: 32

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:	BLUE
Date and times organisms were born between:	02-08-05 0806 TO 1044	Incubator number and shelf location:	2C1
Organism source:	02-01-05 A-F	YCT batch:	01-25-05
Transfer bowl information:	pH = 7.67 SU Temperature = 25.3°C	*Selenastrum* batch:	02-03-05

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	MHS water batch used	Analyst
0	02-08-05	1103	02-06-05	dl
1	02-09-05	1024	02-06-05	dl
2	02-10-05	1007	02-07-05	dl
3	02-11-05	1011	02-07-05	dl
4	02-12-05	1010	02-10-05B	dl
5	02-13-05	1005	02-10-05B	dl
6	02-14-05	1013	02-12-05	dl
7	02-15-05	1033	[redacted]	dl

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	>1400
% Adults having 3rd Broods:	~~30.0~~ 100%	≥ 80%	NOEC	1000
% Mortality:	0%	≤ 20%	LOEC	1200
Mean Offspring/Female:	30.0	≥ 15.0 offspring/female	ChV	1095.4
% CV:	6.8%	< 40.0 %	IC25	1053.6

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 32

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	6	3	5	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	9	11	9	9	10	10	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	18	16	13	14	18	15	15	18
Total young produced		29	30	33	30	27	27	32	29	31	32
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:	30.0

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	5	4	4	5	4	5	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	9	11	11	10	11	12	10	9	11
	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	14	15	17	17	13	18	17	17	15
Total young produced		32	28	31	32	31	29	34	32	31	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.0
% Reduction from Control:	-3.3%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 32

800 mg NaCl/L

Survival and Reproduction Data

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.8
% Reduction from Control:	0.7%

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	3	4	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	11	9	10	10	12	9	9	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	12	12	13	16	13	14	16	16	14
Total young produced		27	27	25	26	30	29	27	29	33	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.1
% Reduction from Control:	6.3%

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 32

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	3	2	0	1	0	0	1	1	0	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	2	2	2	2	4	3	5	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	5	3	0	6	0	0	0	0	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	2	1	5	0	7	0	6	10	0	6
Total young produced		10	6	7	9	9	2	11	14	8	10
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	8.6
% Reduction from Control:	71.3%

1400 mg NaCl/L

Survival and Reproduction Data

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

Concentration:	
% Mortality:	10%
Mean Offspring/Female:	3.8
% Reduction from Control:	87.3%

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	4	6	3	5	4	4	4	5	4	43
5	10	11	9	11	9	9	10	10	11	10	100
6	0	0	0	0	0	0	0	0	0	0	0
7	15	15	18	16	13	14	18	15	15	18	157
Total	29	30	33	30	27	27	32	29	31	32	300

1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	3	4	4	4	4	5	4	41
5	8	11	9	10	10	12	9	9	12	10	100
6	0	0	0	0	0	0	0	0	0	0	0
7	14	12	12	13	16	13	14	16	16	14	140
Total	27	27	25	26	30	29	27	29	33	28	281

600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	5	4	4	5	4	5	5	4	46
5	10	9	11	11	10	11	12	10	9	11	104
6	0	0	0	0	0	0	0	0	0	0	0
7	17	14	15	17	17	13	18	17	17	15	160
Total	32	28	31	32	31	29	34	32	31	30	310

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	3	2	0	1	0	0	1	1	0	2	10
5	0	0	2	2	2	2	4	3	5	2	22
6	5	3	0	6	0	0	0	0	3	0	17
7	2	1	5	0	7	0	6	10	0	6	37
Total	10	6	7	9	9	2	11	14	8	10	86

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	6	4	5	5	4	4	4	4	44
5	10	11	10	12	8	10	9	9	11	10	100
6	0	0	0	0	0	0	0	0	0	0	0
7	14	17	17	15	16	16	15	15	16	13	154
Total	28	32	33	31	29	31	28	28	31	27	298

1400 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	0	1	0	0	0	2
5	0	0	1	0	0	0	0	4	0	0	5
6	0	4	0	2	0	0	0	0	6	0	12
7	0	3	6	3	2	0	3	0	0	2	19
Total	1	7	7	5	2	0	4	4	6	2	38

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 #61 (#32 at 351 Depot St.)

Test dates: February 8-15, 2005

Reviewed 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	29	30	33	30	27	27	32	29	31	32	100	30.0	6.8	Not applicable
600	32	28	31	32	31	29	34	32	31	30	100	31.0	5.5	-3.3
800	28	32	33	31	29	31	28	28	31	27	100	29.8	6.9	0.7
1000	27	27	25	26	30	29	27	29	33	28	100	28.1	8.1	6.3
1200	10	6	7	9	9	2	11	14	8	10	100	8.6	37.3	71.3
1400	1	7	7	5	2	0	4	4	6	2	90	3.8	65.4	87.3

Dunnett's MSD value: 2.396

PMSD: 8.0

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 *Ceriodaphnia* reproduction by 9.7% 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:	2/8/2005	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	2/15/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	FWCHR-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	29.000	30.000	33.000	30.000	27.000	27.000	32.000	29.000	31.000	32.000
600	32.000	28.000	31.000	32.000	31.000	29.000	34.000	32.000	31.000	30.000
800	28.000	32.000	33.000	31.000	29.000	31.000	28.000	28.000	31.000	27.000
1000	27.000	27.000	25.000	26.000	30.000	29.000	27.000	29.000	33.000	28.000
1200	10.000	6.000	7.000	9.000	9.000	2.000	11.000	14.000	8.000	10.000
1400	1.000	7.000	7.000	5.000	2.000	0.000	4.000	4.000	6.000	2.000

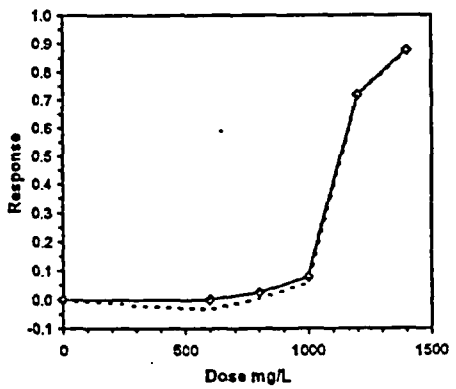
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	30.000	1.0000	30.000	27.000	33.000	6.849	10				30.500	1.0000
600	31.000	1.0333	31.000	28.000	34.000	5.483	10	-0.954	2.287	2.396	30.500	1.0000
800	29.800	0.9933	29.800	27.000	33.000	6.859	10	0.191	2.287	2.396	29.800	0.9770
1000	28.100	0.9367	28.100	25.000	33.000	8.124	10	1.813	2.287	2.396	28.100	0.9213
*1200	8.600	0.2867	8.600	2.000	14.000	37.258	10	20.421	2.287	2.396	8.600	0.2820
*1400	3.800	0.1267	3.800	0.000	7.000	65.408	10	25.002	2.287	2.396	3.800	0.1246

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.56983805	1.035	-0.1081364	0.37941264
Bartlett's Test indicates equal variances (p = 0.52)	4.19896984	15.0862722		

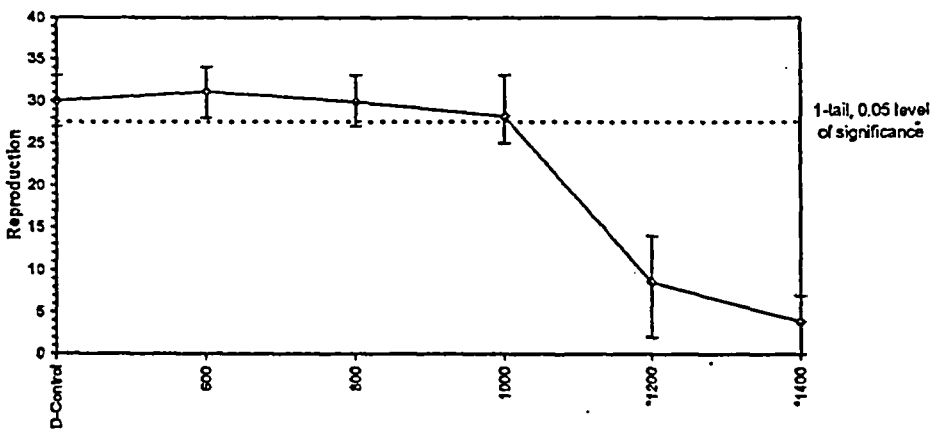
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	1200	1095.44512		2.39625659	0.07987522	1507.53667	5.49074074	4.3E-37	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	897.058824	67.9780995	766.337838	1004.22207	-0.7899
IC10	1006.66667	17.910208	949.658333	1019.21098	-2.6007
IC15	1022.30769	6.59385628	1009.46726	1034.97577	0.1077
IC20	1037.94872	6.26513921	1026.2381	1050.8543	0.1838
IC25	1053.58974	6.07245975	1042.58787	1065.80124	0.2465
IC40	1100.51282	6.39075724	1089.43557	1114.41071	0.2904
IC50	1131.79487	7.2619074	1120.32041	1147.53189	0.2559



Dose-Response Plot



Species: *Ceriodaphnia dubia*

CdNaCLCR #: 32

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Concentration	Parameter						
CONTROL	pH (S.U.)	7.86	7.91	7.86	7.81	7.72	7.79
	DO (mg/L)	7.7	7.7	7.8	7.9	7.8	7.9
	Conductivity (µmhos/cm)	303		308		295	
	Alkalinity (mg $CaCO_3$/L)	58				64	
	Hardness (mg $CaCO_3$/L)	81			88	86	
	Temperature (°C)	24.9	24.8	25.2	24.8	24.9	24.5
600 mg NaCl/L	pH (S.U.)	7.85	7.76	7.81	7.71	7.68	7.72
	DO (mg/L)	7.7	7.7	7.9	8.0	7.9	7.9
	Conductivity (µmhos/cm)	1480		1500		1460	
	Temperature (°C)	25.2	24.9	25.1	24.7	24.8	24.5
800 mg NaCl/L	pH (S.U.)	7.85	7.75	7.81	7.70	7.70	7.67
	DO (mg/L)	7.7	7.7	7.9	8.0	7.9	7.9
	Conductivity (µmhos/cm)	1910		1940		1890	
	Temperature (°C)	25.2	24.7	25.1	24.7	25.1	24.8
1000 mg NaCl/L	pH (S.U.)	7.84	7.75	7.80	7.69	7.71	7.72
	DO (mg/L)	7.8	7.7	7.9	7.9	8.0	7.8
	Conductivity (µmhos/cm)	2260		2300		2250	
	Temperature (°C)	25.0	24.7	25.3	24.6	25.1	24.6
1200 mg NaCl/L	pH (S.U.)	7.82	7.75	7.80	7.66	7.73	7.67
	DO (mg/L)	7.8	7.7	7.9	7.8	8.0	7.8
	Conductivity (µmhos/cm)	2720		2780		2700	
	Temperature (°C)	25.1	24.9	25.1	24.7	24.9	24.6
1400 mg NaCl/L	pH (S.U.)	7.82	7.75	7.82	7.64	7.74	7.63
	DO (mg/L)	7.8	7.7	7.9	7.9	8.0	7.8
	Conductivity (µmhos/cm)	2960		3010		2940	
	Temperature (°C)	25.1	24.7	25.1	24.5	24.9	24.5
STOCK	Conductivity (µmhos/cm)	129000					
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

CdNaCLCR #: 32

		Day							
		3		4		5		6	
	Analyst	CAJ	PCB	PCB	PCB	PCB	CAJ	KEL	CAJ
Concentration	Parameter								
CONTROL	pH (S.U.)	7.82	7.79	7.80	7.99	7.96	8.13	8.11	7.65
	DO (mg/L)	7.8	8.0	7.7	7.8	7.7	8.0	7.8	7.9
	Conductivity (µmhos/cm)	283		307		282		209	
	Alkalinity (mg $CaCO_3$/L)			62				61	
	Hardness (mg $CaCO_3$/L)			84				86	
	Temperature (°C)	25.2	24.6	25.0	24.4	24.9	24.3	24.8	24.5
600 mg NaCl/L	pH (S.U.)	7.76	7.64	7.72	7.86	8.05	8.10	8.16	7.64
	DO (mg/L)	7.8	8.0	7.6	7.8	8.1	8.2	8.1	8.0
	Conductivity (µmhos/cm)	1470		1500		1200		1560	
	Temperature (°C)	25.0	24.6	24.9	24.4	24.8	24.6	24.9	24.5
800 mg NaCl/L	pH (S.U.)	7.74	7.62	7.71	7.88	8.06	8.08	8.18	7.70
	DO (mg/L)	7.8	8.0	7.8	7.7	8.1	8.2	8.3	8.1
	Conductivity (µmhos/cm)	1850		1900		1700		1800	
	Temperature (°C)	25.0	24.4	24.9	24.4	24.8	24.5	25.1	24.5
1000 mg NaCl/L	pH (S.U.)	7.73	7.61	7.76	7.90	8.06	8.06	8.18	7.72
	DO (mg/L)	7.8	7.9	7.9	7.7	8.1	8.2	8.3	8.1
	Conductivity (µmhos/cm)	2250		2330		2080		2160	
	Temperature (°C)	24.9	24.6	24.8	24.4	24.7	24.5	24.8	24.3
1200 mg NaCl/L	pH (S.U.)	7.73	7.61	7.74	7.91	8.06	8.06	8.17	7.76
	DO (mg/L)	7.9	7.9	8.0	7.7	8.0	8.2	8.4	8.2
	Conductivity (µmhos/cm)	2650		2730		2520		2820	
	Temperature (°C)	24.9	24.6	24.9	24.5	24.8	24.3	25.0	24.5
1400 mg NaCl/L	pH (S.U.)	7.74	7.65	7.74	7.91	8.07	8.06	8.16	7.75
	DO (mg/L)	7.8	7.9	8.1	7.7	8.0	8.3	8.3	8.2
	Conductivity (µmhos/cm)	2990		3100		2910		2940	
	Temperature (°C)	25.1	24.5	24.8	24.5	24.7	24.5	24.9	24.4
STOCK	Conductivity (µmhos/cm)	12900							
		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)*

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	02	01	To	05	02	28

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	********	8.9	12	0	12 / 28	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	119	180	26	********	14	21	19	0	4 / 28	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	<42	<43	26	********	<5	<5	19	0	4 / 28	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	1.026	1.281	03	********	********	********	**	0	28 / 28	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	05	03	11
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)*

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	05	02	01	To	05	02	28

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			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 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	05	03	11
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

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	05	02	01	To	05	02	28

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	05	03	11
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	05	02	01	To	05	02	28

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 / 28	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 / 28	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	05	03	11
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	05	02	01	To	05	02	28

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 / 28	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 / 28	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 TYPED OR PRINTED	*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	423 AREA CODE	843-6700 NUMBER	05 YEAR	03 MO	11 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	05	02	01	To	05	02	28

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 SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	05	03	11
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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