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

January 11, 2010

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

Dear Mr. Patrick Cromer:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR DECEMBER 2009

Enclosed is the December 2009 Discharge Monitoring Report for Sequoyah Nuclear Plant. If you have any questions or need additional information, please contact Ann Hurt at (423) 843-6714 or Stephanie Howard at (423) 843-6700 of Sequoyah's Environmental staff.

Sincerely,

Christopher R. Church
Site Vice President
Sequoyah Nuclear Plant

Enclosure
cc (Enclosure):
Chattanooga Environmental Field Office
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
NRR

Printed on recycled paper

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

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	13.9	04	0	31 / 31	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	28.2	04	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.9	04	0	31 / 31	CALCTD
00016 1 W 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0 DAILY MX	DEG. C.		CONTIN UOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	7.5	********	7.8	12	0	5 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	5	5	19	0	1 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		MONTHLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	1 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		MONTHLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1599	03	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

No closed mode operation. The following information is included in an attachment: 1. CCW Data 2. Veliger Monitoring Data

DMR Attachment

CCW Data

CCW TRENCH				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
No water would come out of the pump. No sample could be obtained.				
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
12/09/2009 @ 1010	<0.10 mg/l	12/11/2009 @ 0425	KMF	EPH

Sample Date	Mean # of ZM/m3	% Settlers	Water Temp. (°C)	Sample Date	Mean# of Asiatic Clams/m3	Water Temp. (°C)	LOCATION	SUB LOCATION	NOTES: % Gravid Asiatic Clam	COLLECTED BY
11/03/2009	133	0	16	11/03/2009	76	16	Inplant	RCW		CMW
11/10/2009	417	6.1	16	11/10/2009	25	16	Inplant	RCW		CMW
11/17/2009	269	0	16	11/17/2009	0	16	Inplant	RCW		CMW
11/24/2009	36	50	15	11/24/2009	18	15	Inplant	RCW		CMW
12/01/2009	32	0	13.5	12/01/2009	0	13.5	Inplant	RCW		WE
12/08/2009	38	0	11	12/08/2009	0	11	Inplant	RCW		CMW

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DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 G
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From	09	12	01	TO	09	12	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.015	0.025	19	0	12 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.10 MO AVG	0.10 INST MAX	MG/L		WEEK-DAYS	CALCTD
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	0	62	********	********		**	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	2 DAILY MX	DEG C/HR	********	********	********	****		CONTINUOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	01	07
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments her*

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

TN0026450	101 Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	09	10	01	TO	09	12	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**		<0.20		19	0	1 / 92	
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	REPORT	********	MG/L		QTRLY	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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Boron was sampled on 10/07/2009 @ 1237.

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DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	09	12	01	To	09	12	31

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

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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	********	********	**	Monitoring Not Required	********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	Monitoring Not Required	********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
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	SAMPLE MEASUREMENT										
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments her*

Toxicity was not sampled in December 2009. Report from November 2009 toxicity sampling is attached.

December 10, 2009

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, NOVEMBER, 2009

Per your request, I am only submitting an electronic copy of the subject report. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101, samples collected November 15-20, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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.

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

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

Attachment
cc (Attachment):
Sherrard, R. M., PSC 1X-C
Files, OE&R, CEB 1B-M

SQN November 2009M

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: December 10, 2009

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): 1,579
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 3,491
8. Outfall Tested: 101
9. Dates Sampled: November 15-20, 2009
10. Average Flow on Days Sampled (MGD): 870, 873, 1761
11. Pertinent Site Conditions: Production / operation data will be provided upon request.
12. Test Dates: November 17-24, 2009
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
    Intake: 100.0
    Pimephales promelas: UV treated Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
    UV treated Intake: 100.0
16. Permit Limit Endpoint (%): Outfall 101: IC_{25} = 45.2%
17. Test Results: Outfall 101: *Pimephales promelas:* IC_{25} > 100%
    Ceriodaphnia dubia: IC_{25} > 100%
    UV treated Outfall 101: *Pimephales promelas:* IC_{25} > 100%

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

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

20. Lab Contact: Jim Sumner Phone #: (828) 350-9364

21. TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755

22. Notes: Outfall 101 samples collected November 15 – 20, 2009, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant difference from the 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.

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) Last Used By
101	11-15-09 0944 to 11-16-09 0844	11-17-09 1315	0.6, 0.7	<0.10	11-17-09 1500 11-18-09 1413
Intake	11-15-09 1014 to 11-16-09 0914	11-17-09 1315	1.1	<0.10	11-17-09 1500 11-18-09 1413
101	11-17-09 0745 to 11-18-09 0645	11-18-09 1505	1.3, 1.4	<0.10	11-19-09 1400 11-20-09 1411
Intake	11-17-09 0805 to 11-18-09 0705	11-18-09 1505	0.7	<0.10	11-19-09 1400 11-20-09 1411
101	11-19-09 0735 to 11-20-09 0635	11-20-09 1440	0.8, 0.9	<0.10	11-20-09 1405 11-21-09 1418 11-22-09 1410
Intake	11-19-09 0756 to 11-20-09 0656	11-20-09 1440	1.0	<0.10	11-20-09 1405 11-21-09 1418 11-22-09 1410

*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.

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatox, Inc.	In-house Cultures
2. Age:	22.50-22.73 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	11-17-09 1444 ET	11-17-09 1500 ET
UV Treated Outfall 101	11-17-09 1430 ET	
7. Test Termination: (Date/Time)		
Outfall 101	11-24-09 1346 ET	11-24-09 1402 ET
UV Treated Outfall 101	11-24-09 1331 ET	
8. Test Temperature: Outfall 101:	Mean = 24.8°C (24.5 – 25.3°C)	Mean = 24.9°C (24.6 - 25.3°C)

Test Temperature: UV-Treated Outfall 101: Mean = 24.9°C (24.5 - 25.3°C)

9. Physical / Chemical Measurements: Alkalinity, hardness, total residual chlorine, and conductivity were measured at the laboratory in each 100% sample. Daily temperatures were measured in one replicate for each test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted November 17 – 24, 2009 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
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	98	98	98	98
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	98	90	88	88

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.830	0.817	0.842	0.797	0.822
11.3%	0.857	0.820	0.819	0.839	0.834
22.6%	0.849	0.792	0.794	0.884	0.830
45.2%	0.782	0.832	0.849	0.772	0.809
72.6%	0.806	0.758	0.770	0.781	0.779
100.0%	0.852	0.792	0.697	0.716	0.764
Intake	0.397	0.778	0.801	0.889	0.716

IC_{25} Value: > 100% Permit Limit: 45.2% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.2 TUc

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted November 17 - 24, 2009 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
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/6 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	32	29	26	30	27	30	28	29	31	33	29.5
11.3%	32	31	28	31	30	30	30	28	29	33	30.2
22.6%	32	32	29	32	32	32	32	32	32	34	31.9
45.2%	33	34	33	31	32	36	30	34	33	32	32.8
72.6%	33	34	34	32	37	33	38	34	30	32	33.7
100.0%	35	36	32	36	34	36	38	36	38	38	35.9

IC_{25} Value: > 100% Permit Limit: 45.2% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.2 TUc

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted November 17 - 24, 2009 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/6 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	31	27	30	32	28	30	31	30	31	28	29.8
Intake	38	35	33	30	29	33	32	31	31	33	32.5

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

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

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

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

Conducted November 17 – 24, 2009 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
11.3%	100	100	100	100	100	98	98
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.848	0.718	0.772	0.870	0.802
11.3%	0.876	0.857	0.764	0.755	0.813
22.6%	0.749	0.796	0.854	0.806	0.801
45.2%	0.724	0.816	0.825	0.865	0.808
72.6%	0.890	0.775	0.856	0.814	0.834
100.0%	0.775	0.757	0.939	0.867	0.835
Intake	0.813	0.726	0.780	0.770	0.772

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

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

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	November 17-24, 2009	1220	7-days	KCl	0.79 g/L
Ceriodaphnia dubia	November 10-17, 2009	1115	6-days	NaCl	1.07 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Non-treated Sequoyah Nuclear Plant (SQN) Outfall 101 performed November 17-24, 2009.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24.8	24.7	7.8	7.4	7.58	7.37	332	62	90	-
		24.7 - 24.8	24.6 - 24.8	7.6 - 8.0	6.9 - 7.7	7.42 - 7.79	7.20 - 7.56	325 - 336	61 - 62	88 - 90	- -
	11.3%	24.8	24.7	7.9	7.3	7.66	7.32	308	-	-	-
		24.7 - 25.0	24.5 - 24.9	7.7 - 8.2	6.9 - 7.6	7.57 - 7.79	7.15 - 7.50	297 - 317	- -	- -	- -
	22.6%	24.9	24.8	8.0	7.1	7.63	7.29	291	-	-	-
		24.7 - 25.0	24.6 - 25.0	7.8 - 8.2	6.3 - 7.6	7.53 - 7.74	7.11 - 7.50	280 - 299	- -	- -	- -
	45.2%	24.9	24.8	8.0	7.1	7.61	7.29	256	-	-	-
		24.7 - 25.1	24.6 - 25.0	7.7 - 8.2	6.4 - 7.7	7.47 - 7.73	7.14 - 7.51	249 - 266	- -	- -	- -
	72.6%	24.9	24.7	8.1	7.2	7.57	7.28	218	-	-	-
		24.7 - 25.1	24.5 - 24.9	7.7 - 8.3	6.6 - 7.8	7.41 - 7.70	7.04 - 7.51	211 - 225	- -	- -	- -
	100.0%	25.0	24.7	8.1	7.2	7.52	7.25	172	75	87	< 0.10
		24.7 - 25.3	24.5 - 25.1	7.7 - 8.3	6.5 - 7.7	7.32 - 7.67	7.01 - 7.46	166 - 181	62 - 96	69 - 110	< 0.10 - < 0.10
	Intake	24.9	24.7	8.2	7.2	7.49	7.24	170	63	75	< 0.10
		24.8 - 25.0	24.6 - 25.1	7.8 - 8.4	6.5 - 7.9	7.26 - 7.64	7.01 - 7.49	163 - 179	58 - 66	69 - 82	< 0.10 - < 0.10
Ceriodaphnia dubia	Control	24.8	25.0	7.8	7.9	7.58	7.59	332	62	90	-
		24.6 - 24.9	24.9 - 25.3	7.6 - 8.0	7.7 - 8.1	7.42 - 7.79	7.51 - 7.71	325 - 336	61 - 62	88 - 90	- -
	11.3%	24.8	25.0	7.9	7.9	7.66	7.59	309	-	-	-
		24.7 - 24.9	24.9 - 25.2	7.7 - 8.2	7.6 - 8.1	7.57 - 7.79	7.52 - 7.71	297 - 317	- -	- -	- -
	22.6%	24.9	25.0	8.0	7.9	7.63	7.59	291	-	-	-
		24.7 - 25.0	25.0 - 25.1	7.8 - 8.2	7.5 - 8.1	7.53 - 7.74	7.52 - 7.71	280 - 299	- -	- -	- -
	45.2%	24.9	25.0	8.0	7.9	7.61	7.58	256	-	-	-
		24.7 - 25.0	24.9 - 25.2	7.7 - 8.2	7.6 - 8.2	7.47 - 7.73	7.51 - 7.71	249 - 266	- -	- -	- -
	72.6%	24.9	24.9	8.1	7.9	7.57	7.57	218	-	-	-
		24.8 - 25.0	24.8 - 25.1	7.7 - 8.3	7.6 - 8.2	7.41 - 7.70	7.48 - 7.69	211 - 225	- -	- -	- -
	100.0%	25.0	25.0	8.1	7.9	7.52	7.55	172	75	87	< 0.10
		24.8 - 25.2	24.8 - 25.2	7.7 - 8.3	7.6 - 8.2	7.32 - 7.67	7.46 - 7.66	166 - 181	62 - 96	69 - 110	< 0.10 - < 0.10
	Intake	25.0	25.0	8.2	7.9	7.49	7.56	170	63	75	< 0.10
		24.9 - 25.0	24.8 - 25.2	7.8 - 8.4	7.6 - 8.1	7.26 - 7.64	7.46 - 7.66	163 - 179	58 - 66	69 - 82	< 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.8	24.5	25.3
Ceriodaphnia dubia	24.9	24.6	25.3

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* Tests, UV-treated Sequoyah Nuclear Plant (SQN) Outfall 101 performed November 17-24, 2009.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)
Pimephales promelas	Control	24.8	24.8	8.0	7.3	7.61	7.35	321	61	89
		24.7 - 25.0	24.7 - 24.9	7.9 - 8.2	6.4 - 8.1	7.53 - 7.68	7.19 - 7.53	312 - 332	61 - 62	86 - 90
	11.3%	24.9	24.8	7.9	7.3	7.62	7.33	308		
		24.8 - 25.1	24.6 - 25.0	7.7 - 8.0	6.9 - 7.6	7.54 - 7.68	7.16 - 7.51	301 - 312		
	22.6%	24.9	24.7	7.9	7.3	7.61	7.33	293		
		24.8 - 25.1	24.6 - 24.9	7.8 - 8.1	7.1 - 7.7	7.53 - 7.69	7.16 - 7.52	290 - 299		
	45.2%	25.0	24.8	8.0	7.3	7.59	7.31	265		
		24.8 - 25.2	24.7 - 24.8	7.9 - 8.1	7.0 - 7.7	7.49 - 7.68	7.15 - 7.49	259 - 273		
	72.6%	25.0	24.8	8.0	7.2	7.55	7.30	218		
		24.8 - 25.2	24.6 - 25.0	7.8 - 8.1	6.8 - 7.7	7.43 - 7.65	7.11 - 7.48	214 - 223		
	100.0%	25.1	24.8	8.0	7.3	7.51	7.28	173	63	74
		24.9 - 25.3	24.7 - 24.9	8.0 - 8.2	6.9 - 7.8	7.37 - 7.62	7.09 - 7.47	169 - 181	58 - 68	65 - 78
	Intake	25.0	24.7	8.1	7.3	7.51	7.26	171	63	72
		24.9 - 25.2	24.5 - 24.8	8.0 - 8.3	6.9 - 7.8	7.37 - 7.61	7.07 - 7.47	160 - 189	60 - 66	69 - 78

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.9	24.5	25.3

SUMMARY / CONCLUSIONS

Outfall 101 samples collected November 15-20, 2009, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of minnows and daphnids to intake samples resulted in no significant difference from the controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to non-treated and UV treated samples.

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 500-mL plastic disposable cups, 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. Reagents, 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 SM 2550 B.

4. Dissolved oxygen was measured by SM 4500 O G.

5. The pH was measured by SM 4500 H+ B.

6. Conductance was measured by SM 2510 B.

7. Alkalinity was measured by SM 2320 B.

8. Total hardness was measured by SM 2340 C.

9. Total residual chlorine was measured by ORION Electrode Method 97-70.

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. Standard Methods for the Examination of Water and Wastewater, 21st Edition, 2005.

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

Sequoyah Nuclear Plant Biomonitoring
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Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

Diffuser Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion and Mollusks During Toxicity Test Sampling

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – November 20, 2009

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. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – November 20, 2009

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. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – November 20, 2009

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 – November 20, 2009

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. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – November 20, 2009

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	H-150M mg/L Quat
11/07/2004	-	<0.0187	0.000	0.014	-	-	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041	-	-
11/10/2004	-	<0.0149	0.047	0.016	-	-	0.041	-	-
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043	-	-
11/12/2004	-	<0.0253	0.048	0.017	-	-	0.042	-	-
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	-
06/05/2005	-	0.0063	-	-	-	-	-	-	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005	-	0.0103	-	-	-	-	-	-	0.037
06/08/2005	-	0.0295	-	-	-	-	-	-	0.037
06/09/2005	-	0.0129	-	-	-	-	-	-	-
06/10/2005	-	0.0184	-	-	-	-	-	-	-
07/17/2005	-	0.0109	0.026	0.009	-	-	-	-	-
07/18/2005	-	0.0150	0.026	0.009	-	-	-	-	0.036
07/19/2005	-	0.0163	0.026	0.009	-	-	-	-	0.036
07/20/2005	-	0.0209	0.026	0.009	-	-	-	0.014	0.036
07/21/2005	-	0.0242	0.026	0.009	-	-	-	-	-
07/22/2005	-	0.0238	0.054	0.018	-	-	-	0.014	-
10/30/2005	-	0.0068	-	-	-	-	-	-	-
10/31/2005	-	0.0112	-	-	-	-	-	-	-
11/01/2005	-	0.0104	-	-	-	-	-	-	0.035
11/02/2005	-	0.0104	-	-	-	-	-	-	0.036
11/03/2005	-	0.0117	-	-	-	-	-	-	0.036
11/04/2005	-	0.0165	-	-	-	-	-	-	0.035
11/14/2005	-	0.0274	-	-	-	-	-	-	-
11/15/2005	-	0.0256	-	-	-	-	-	-	-
11/16/2005	-	0.0234	-	-	-	-	-	-	-
11/17/2005	-	0.0231	-	-	-	-	-	-	-
11/18/2005	-	0.0200	-	-	-	-	-	-	-
11/19/2005	-	0.0116	-	-	-	-	-	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 – November 20, 2009

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	H-150M mg/L Quat	MSW 101 mg/L Phosphate
11/12/2006	-	0.0055	-	-	-	-	-	-	-	-
11/13/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/14/2006	-	0.0143	-	-	-	-	-	-	0.037	-
11/15/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/16/2006	-	0.0267	-	-	-	-	-	-	0.037	-
11/17/2006	-	0.0222	-	-	-	-	-	-	-	-
11/26/2006	-	0.0188	-	-	-	-	-	-	-	-
11/27/2006	-	0.0138	-	-	-	-	-	-	-	-
11/28/2006	-	0.0120	-	-	-	-	-	-	-	-
11/29/2006	-	0.0288	-	-	-	-	-	-	-	-
11/30/2006	-	0.0376	-	-	-	-	-	-	-	-
12/01/2006	-	0.0187	-	-	-	-	-	-	-	-
05/28/07	-	-	-	-	-	-	-	-	-	0.015
05/29/07	-	-	-	-	-	-	-	-	0.036	0.015
05/30/07	-	0.0084	-	-	-	-	-	0.017	0.036	0.015
05/31/07	-	0.0103	-	-	-	-	-	-	0.036	0.015
06/01/07	-	0.0164	-	-	-	-	-	0.017	0.036	0.015
06/02/07	-	0.0305	-	-	-	-	-	-	-	0.015
12/02/07	-	0.0241	-	-	-	-	-	-	-	-
12/03/07	-	0.0128	-	-	-	-	-	-	-	-
12/04/07	-	0.0238	-	-	-	-	-	-	-	-
12/05/07	-	0.0158	-	-	-	-	-	-	-	-
12/06/07	-	0.0162	-	-	-	-	-	-	-	-
12/07/07	-	0.0175	-	-	-	-	-	-	-	-
04/13/08	-	0.0039	-	-	-	-	-	-	-	-
04/14/08	-	0.0124	-	-	-	-	-	-	-	-
04/15/08	-	0.0229	-	-	-	-	-	-	-	-
04/16/08	-	0.0143	-	-	-	-	-	-	-	-
04/17/08	-	0.0120	-	-	-	-	-	-	-	-
04/18/08	-	0.0149	-	-	-	-	-	-	-	-
10/26/08	-	0.0260	-	-	-	-	-	-	-	-
10/27/08	-	0.0151	-	-	-	-	-	0.017	-	-
10/28/08	-	0.0172	-	-	-	-	-	-	0.041	-
10/29/08	-	0.0154	-	-	-	-	-	0.018	0.041	0.030
10/30/08	-	-	-	-	-	-	-	-	0.041	0.030
10/31/08	-	0.0086	-	-	-	-	-	-	0.041	0.030

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 –November 20, 2009

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	H-150M mg/L Quat	MSW 101 mg/L Phosphate
02/08/09	-	0.0197	-	-	-	-	-	0.017	-	-
02/09/09	-	0.0237	-	-	-	-	-	0.017	-	-
02/10/09	-	0.0104	-	-	-	-	-	0.021	-	-
02/11/09	-	0.0155	-	-	-	-	-	0.017	-	-
02/12/09	-	0.0106	-	-	-	-	-	0.017	-	-
02/13/09	-	-	-	-	-	-	-	-	-	-
05/10/09	-	0.0129	-	-	-	-	-	-	-	-
05/11/09	-	0.0415	-	-	-	-	-	-	0.0446	-
05/12/09	-	0.0053	-	-	-	-	-	-	0.0396	-
05/13/09	-	0.0049	-	-	-	-	-	-	0.0396	-
05/14/09	-	<0.0141	-	-	-	-	-	-	0.0397	-
05/15/09	-	<0.0160	-	-	-	-	-	-	-	-
11/15/09	-	0.025	-	-	-	-	-	-	-	-
11/16/09	-	0.0152	-	-	-	-	-	-	-	-
11/17/09	-	0.0255	-	-	-	-	-	-	-	-
11/18/09	-	0.0306	-	-	-	-	-	-	-	-
11/19/09	-	0.0204	-	-	-	-	-	-	-	-
11/20/09	-	0.0093	-	-	-	-	-	-	-	-

Sequoyah Nuclear Plant Biomonitoring
November 17 – 24, 2009

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: Adam Deimling & Stephen Williams

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:
Adam Deimling :
Stephen Williams :
Samples remained on ice throughout sampling and transport to lab. Dissolved Metals sample filtered and place on ice.

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use: project # 5012				
										SQN INT 091117.06	1.1°C	JL	1315	*
		Date (mm/dd/yy)	Time (EST)			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time ET	Appearance
SQN-101-TOX A	Comp	11/15/09 – 11/16/09	0944 - 0844	1 (2.5gal)	870.34					091117.05	0.6°C	JL	1315	*
SQN-101-TOX B	Comp	11/15/09 – 11/16/09	0944 - 0844	1 (2.5gal)	870.34					↓	0.7°C	JL	1315	*
SQN-INT-TOX	Comp	11/15/09 – 11/16/09	1014 - 0914	1 (2.5 gal)	NA					* custody seals intact. Samples received in good condition.				

Sample Custody – Fill In From Top Down

* TRC ABSENT IN ALL SAMPLES

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Adam Deimling TVA	12:30 ET 11/16/09	Express Courier BR Shiles	12:30 ET 11-16-09
Express Courier BR Shiles	11-17-09 1315 ET	ETS	11-17-09 1315 ET

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Adam Deimling & Stephen Williams

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:
Adam Deimling :
Jonathan Walker :
Samples remained on ice throughout sampling and transport to lab. Dissolved Metals sample filtered and place on ice.

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 5812 Laboratory Use				
		Date (mm/dd/yy)	Time (EST)			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time ET	Appearance
SQN-101-TOX A	Comp	11/17/09 – 11/18/09	0745 - 0645	1 (2.5gal)	872.78		0.18			091118.03	1.3°C	JS	1505	*
SQN-101-TOX B	Comp	11/17/09 – 11/18/09	0745 - 0645	1 (2.5gal)	872.78		0.18			091118.03	1.4°C	JS	1505	*
SQN-INT-TOX	Comp	11/17/09 – 11/18/09	0805 - 0705	1 (2.5 gal)	NA		0.18			091118.04	0.7°C	JS	1505	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition
* TRC ABSENT IN ALL SAMPLES

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Adam Deimling TVA	1005 ET 11-18-09	Express Courier BR Shiles	10:05 ET 11-18-09
Express Courier BR Shiles	11-18-09 1505 ET	ETS	11-18-09 1505 ET

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 2 of 2

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Adam Deimling & Stephen Williams

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:
Adam Deimling : [signature]
Stephen Williams : [signature]
Samples remained on ice throughout sampling and transport to lab. Dissolved Metals sample filtered and place on ice.

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 5812 Laboratory Use				
		Date (mm/dd/yy)	Time (EST)			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time ET	Appearance
SQN-101-TOX A	Comp	11/19/09 – 11/20/09	0735 - 0635	1 (2.5gal)	1760.46					091120.04	0.8°C	[illegible]	1440	*
SQN-101-TOX B	Comp	11/19/09 – 11/20/09	0735 - 0635	1 (2.5gal)	1760.46					091120.04	0.9°C	[illegible]	1440	*
SQN-INT-TOX	Comp	11/19/09 – 11/20/09	0756 - 0656	1 (2.5 gal)	NA					091120.05	1.0°C	[illegible]	1440	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition. [signature] TRC ABSENT IN ALL SAMPLES.

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Adam Deimling [signature]	11-20-09 0950 ET	Express Courier BR Skiles	11-20-09 - 09:50 ET
Express Courier BR Skiles	11-20-09 ~~0970~~ 1440 ET	ETS [signature]	11-20-09 1440 ET

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.

ETS
Environmental Testing Solutions, Inc.

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

Species: *Pimephales promelas*

Client: Tennessee Valley Authority
Facility: Sequoyah Nuclear Plant
NPDES #: ~~TN0020168~~ TN0026450
Project #: 5817

County: ~~Rhea~~ HAMILTON
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	565	1130	1815	2500	
Diluent volume (mL)	2217.5	1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	22.73 HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	11-16-09 1600	Incubator number and shelf location:	3C
Organism source:	ATOX BATCH 11-16-09	*Artemia* CHM number:	CHM444
		Drying information for weight determination:	
Transfer bowl information:	pH = 7.50 S.U. Temperature = 24.7°C	Date / Time in oven:	11-24-09 1350
		Initial oven temperature:	60°C
Average transfer volume:	0.2305 ml	Date / Time out of oven:	11-25-09 1350
		Final oven temperature:	60°C
		Total drying time:	24 HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding		Afternoon feeding		Test initiation, renewal, or termination		Sample numbers used		MHSW batch used
		Time	Analyst	Time	Analyst	Time	Analyst	Outfall 101	Intake	
0	11-17-09	—	—	1600	JH	1444	JH	091117.05	091117.06	11-12-09A
1	11-18-09	0800	JH	1400	JH	1348	JH	091117.05	091117.06	11-12-09A
2	11-19-09	0800	JH	1400	JH	1345	JH	091118.03	091118.04	11-12-09B
3	11-20-09	0800	JH	1400	JH	1349	JH	091118.03	091118.04	11-12-09B
4	11-21-09	0800	JH	1400	JH	1345	JH	091120.04	091120.05	11-17-09
5	11-22-09	0800	JH	1400	JH	1350	JH	091120.04	091120.05	11-19-09
6	11-23-09	0800	JH	1400	JH	1347	JH	091120.04	091120.05	11-19-09
7	11-24-09					1346	JH			

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.822	
Average weight per surviving larvae:	0.822	≥ 0.25mg/larvae

Summary of test endpoints:	
7-day LC_{50}	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC_{25}	>100%

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 11-17-09

Survival and Growth Data

Day	CONTROL Non-treated				11.3%				22.6%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray color code:: Purple Analyst: KS Date: 10-29-09	13.60	14.25	13.11	15.55	13.18	14.47	14.12	13.60	13.09	14.93	14.42	14.65
B = Pan + Larvae weight (mg) Analyst: MS Date: 12-01-09	21.90	22.42	21.53	23.52	21.75	22.67	22.31	21.99	21.58	22.85	22.36	23.49
C = Larvae weight (mg) = B – A	8.30	8.17	8.42	7.97	8.57	8.20	8.19	8.39	8.49	7.92	7.94	8.84
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.830	0.817	0.842	0.797	0.857	0.820	0.819	0.839	0.849	0.792	0.794	0.884
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.822				0.834		-1.5%		0.830		-1.0%	

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: JL

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 11-17-09

Survival and Growth Data

Day	45.2%				72.6%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	9 d	10	10	10	10	10	10	10	10	10	10
5	10	9	10	10	10	10	10	10	10	10	10	10
6	10	9	10	10	10	10	10	10	10	10	10	10
7	10	9 d	10	10	10	10	10	10	10	10	10 ISM	10 ISM
A = Pan weight (mg) Tray color code:: Purple Analyst: KIS Date: 10-29-09	13.13	14.12	13.99	11.91	14.05	14.01	15.77	14.91	13.61	14.38	13.83	15.26
B = Pan + Larvae weight (mg) Analyst: MD Date: 12-01-09	20.95	22.44	22.48	19.63	22.11	21.59	23.47	22.72	22.13	22.30	20.80	22.42
C = Larvae weight (mg) = B – A	7.82	8.32	8.49	7.72	8.06	7.58	7.70	7.81	8.52	7.92	6.97	7.16
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.782	0.832	0.849	0.772	0.806	0.758	0.770	0.781	0.852	0.792	0.697	0.716
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.809		1.6%		0.779		5.2%		0.764		7.0%	

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: [illegible]

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 11-17-09

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	9 1dFG	10	10	10
5	6 3dFG	10	10	10
6	5 1dFG	10	10	10
7	5	10	10	10
A = Pan weight (mg) Tray color code:: Purple Analyst: KLS Date: 10-29-09	14.87	13.41	14.49	14.40
B = Pan + Larvae weight (mg) Analyst: BG Date: 12-01-09	18.84	21.19	22.50	23.29
C = Larvae weight (mg) = B – A	3.97	7.78	8.01	8.89
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.397	0.778	0.801	0.889
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.716		12.8%	

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: JH

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
November 17-24, 2009

ETS
Environmental Testing Solutions, Inc.

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

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

Project number: 5812
Reviewed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Not for Compliance Assessment, Internal Laboratory QC: 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	13.60	21.90	8.30	0.830	0.822	2.3	0.830	100.0	0.822	2.3	Not applicable
	B	10	10	14.25	22.42	8.17	0.817			0.817				
	C	10	10	13.11	21.53	8.42	0.842			0.842				
	D	10	10	15.55	23.52	7.97	0.797			0.797				
11.3%	E	10	10	13.18	21.75	8.57	0.857	0.834	2.2	0.857	100.0	0.834	2.2	-1.5
	F	10	10	14.47	22.67	8.20	0.820			0.820				
	G	10	10	14.12	22.31	8.19	0.819			0.819				
	H	10	10	13.60	21.99	8.39	0.839			0.839				
22.6%	I	10	10	13.09	21.58	8.49	0.849	0.830	5.4	0.849	100.0	0.830	5.4	-1.0
	J	10	10	14.93	22.85	7.92	0.792			0.792				
	K	10	10	14.42	22.36	7.94	0.794			0.794				
	L	10	10	14.65	23.49	8.84	0.884			0.884				
45.2%	M	10	10	13.13	20.95	7.82	0.782	0.832	8.5	0.782	97.5	0.809	4.6	1.6
	N	10	9	14.12	22.44	8.32	0.924			0.832				
	O	10	10	13.99	22.48	8.49	0.849			0.849				
	P	10	10	11.91	19.63	7.72	0.772			0.772				
72.6%	Q	10	10	14.05	22.11	8.06	0.806	0.779	2.6	0.806	100.0	0.779	2.6	5.2
	R	10	10	14.01	21.59	7.58	0.758			0.758				
	S	10	10	15.77	23.47	7.70	0.770			0.770				
	T	10	10	14.91	22.72	7.81	0.781			0.781				
100%	U	10	10	13.61	22.13	8.52	0.852	0.764	9.4	0.852	100.0	0.764	9.4	7.0
	V	10	10	14.38	22.30	7.92	0.792			0.792				
	W	10	10	13.83	20.80	6.97	0.697			0.697				
	X	10	10	15.26	22.42	7.16	0.716			0.716				
100% Intake	Y	10	5	14.87	18.84	3.97	0.794	0.816	6.1	0.397	87.5	0.716	30.5	12.8
	Z	10	10	13.41	21.19	7.78	0.778			0.778				
	AA	10	10	14.49	22.50	8.01	0.801			0.801				
	BB	10	10	14.40	23.29	8.89	0.889			0.889				

Outfall 101:
Dunnett's MSD value: 0.0683
PMSD: 8.3

Intake:
Dunnett's MSD value: 0.2577
PMSD: 31.4

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
November 17-24, 2009
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/17/2009	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/24/2009	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	0.8300	0.8170	0.8420	0.7970
11.3	0.8570	0.8200	0.8190	0.8390
22.6	0.8490	0.7920	0.7940	0.8840
45.2	0.7820	0.8320	0.8490	0.7720
72.6	0.8060	0.7580	0.7700	0.7810
100	0.8520	0.7920	0.6970	0.7160
Intake	0.3970	0.7780	0.8010	0.8890

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8215	1.0000	0.8215	0.7970	0.8420	2.345	4				0.8283	1.0000
11.3	0.8338	1.0149	0.8338	0.8190	0.8570	2.162	4	-0.432	2.410	0.0683	0.8283	1.0000
22.6	0.8298	1.0100	0.8298	0.7920	0.8840	5.397	4	-0.291	2.410	0.0683	0.8283	1.0000
45.2	0.8088	0.9845	0.8088	0.7720	0.8490	4.641	4	0.450	2.410	0.0683	0.8088	0.9764
72.6	0.7788	0.9480	0.7788	0.7580	0.8060	2.626	4	1.509	2.410	0.0683	0.7788	0.9401
100	0.7643	0.9303	0.7643	0.6970	0.8520	9.351	4	2.020	2.410	0.0683	0.7643	0.9226
Intake	0.7163	0.8719	0.7163	0.3970	0.8890	30.456	4					

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98188138	0.884	0.392664346	0.32317638
Bartlett's Test indicates equal variances (p = 0.14)	8.39288521	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	0.06829131	0.08313002	0.00325397	0.00160593	0.123331696	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	65.141			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
Non-treated
November 17-24, 2009

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/17/2009	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
End Date:	11/24/2009	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	0.8300	0.8170	0.8420	0.7970
11.3	0.8570	0.8200	0.8190	0.8390
22.6	0.8490	0.7920	0.7940	0.8840
45.2	0.7820	0.8320	0.8490	0.7720
72.6	0.8060	0.7580	0.7700	0.7810
100	0.8520	0.7920	0.6970	0.7160
Intake	0.3970	0.7780	0.8010	0.8890

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.8215	1.0000	0.8215	0.7970	0.8420	2.345	4			
11.3	0.8338	1.0149	0.8338	0.8190	0.8570	2.162	4			
22.6	0.8298	1.0100	0.8298	0.7920	0.8840	5.397	4			
45.2	0.8088	0.9845	0.8088	0.7720	0.8490	4.641	4			
72.6	0.7788	0.9480	0.7788	0.7580	0.8060	2.626	4			
100	0.7643	0.9303	0.7643	0.6970	0.8520	9.351	4			
Intake	0.7163	0.8719	0.7163	0.3970	0.8890	30.456	4	0.961	2.353	0.2577

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.82512182	0.749	-1.7159101	4.30798649
F-Test indicates unequal variances (p = 2.30E-03)	128.264832	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Heteroscedastic t Test indicates no significant differences Treatments vs D-Control	0.25768323	0.31367405	0.02215513	0.02397863	0.37355912	1, 6

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
November 17-24, 2009

ETS
Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Project number: 5812
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)	7.48	7.50	7.63	7.41	7.50	7.44	7.71	7.56	7.55	7.20	7.42	7.23	7.79	7.24
	DO (mg/L)	7.8	7.5	7.6	7.3	7.7	7.5	7.8	7.7	7.9	7.5	7.8	6.9	8.0	7.1
	Conductivity (µmhos/cm)	325		332		328		332		336		334		334	
	Alkalinity (mg/L $CaCO_3$)	61				62				62		62			
	Hardness (mg/L $CaCO_3$)	90				90				90		88			
	Temperature (°C)	24.8	24.6	24.8	24.8	24.8	24.6	24.7	24.8	24.7	24.6	24.7	24.6	24.8	24.8
11.3%	pH (SU)	7.79	7.46	7.66	7.37	7.57	7.37	7.73	7.50	7.68	7.18	7.57	7.20	7.62	7.15
	DO (mg/L)	8.0	7.3	7.7	7.3	7.7	7.3	8.2	7.6	8.1	7.4	7.8	6.9	8.0	7.1
	Conductivity (µmhos/cm)	317		312		313		308		307		303		297	
	Temperature (°C)	25.0	24.6	24.9	24.9	24.9	24.8	24.7	24.5	24.8	24.8	24.7	24.8	24.8	24.8
22.6%	pH (SU)	7.74	7.44	7.62	7.35	7.56	7.33	7.72	7.50	7.65	7.17	7.53	7.11	7.61	7.14
	DO (mg/L)	8.0	7.4	7.8	7.1	7.9	7.2	8.2	7.6	8.0	7.3	7.9	6.3	8.1	6.8
	Conductivity (µmhos/cm)	299		293		296		288		296		286		280	
	Temperature (°C)	25.0	24.8	24.9	25.0	24.9	24.8	24.8	24.9	24.8	24.8	24.7	24.6	24.9	24.8
45.2%	pH (SU)	7.73	7.44	7.61	7.32	7.51	7.33	7.71	7.51	7.62	7.16	7.47	7.15	7.59	7.14
	DO (mg/L)	8.1	7.4	7.7	7.1	7.9	7.1	8.2	7.7	8.1	7.3	8.0	6.4	8.1	6.8
	Conductivity (µmhos/cm)	266		259		258		254		255		254		249	
	Temperature (°C)	25.1	24.9	24.9	25.0	24.9	24.9	25.0	24.9	24.8	24.7	24.7	24.6	24.9	24.7
72.6%	pH (SU)	7.70	7.43	7.59	7.29	7.48	7.33	7.67	7.51	7.60	7.23	7.41	7.15	7.56	7.04
	DO (mg/L)	8.1	7.3	7.7	7.0	7.9	7.1	8.2	7.8	8.3	7.4	8.2	6.6	8.2	6.9
	Conductivity (µmhos/cm)	225		221		222		217		213		217		211	
	Temperature (°C)	25.1	24.8	24.9	24.9	24.9	24.5	25.0	24.8	24.8	24.7	24.7	24.6	24.9	24.5
100%	pH (SU)	7.67	7.42	7.57	7.34	7.44	7.33	7.63	7.46	7.55	7.09	7.32	7.13	7.48	7.01
	DO (mg/L)	8.1	7.3	7.7	7.2	8.0	7.3	8.0	7.7	8.1	7.5	8.3	6.8	8.2	6.5
	Conductivity (µmhos/cm)	181		180		174		166		167		168		166	
	Alkalinity (mg/L $CaCO_3$)	96				66				62					
	Hardness (mg/L $CaCO_3$)	82				110				69					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.3	24.5	25.0	25.1	25.0	24.7	25.1	24.6	25.0	24.7	24.7	24.5	24.9	24.7
100% Intake	pH (SU)	7.57	7.43	7.57	7.34	7.42	7.33	7.64	7.49	7.52	7.07	7.26	7.04	7.47	7.01
	DO (mg/L)	8.3	7.6	7.8	7.2	8.1	7.4	8.2	7.9	8.1	7.5	8.4	6.5	8.2	6.5
	Conductivity (µmhos/cm)	178		179		172		164		167		167		163	
	Alkalinity (mg/L $CaCO_3$)	66				64				58					
	Hardness (mg/L $CaCO_3$)	82				69				73					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.7	25.0	25.1	24.8	24.7	25.0	24.6	25.0	24.6	24.9	24.6	24.9	24.7

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** **Date:** 11-17-09
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated**
Daily Chemistry:

		Day					
		0		1		2	
	Analyst	MLK	MLK	MLK	LAB	LAB	MLK
Concentration	Parameter						
CONTROL Non-treated	pH (S.U.)	7.48	7.50	7.63	7.41	7.50	7.44
	DO (mg/L)	7.8	7.5	7.6	7.3	7.7	7.5
	Conductivity (µmhos/cm)	325		332		328	
	Alkalinity (mg $CaCO_3$/L)	61				62	
	Hardness (mg $CaCO_3$/L)	90				90	
	Temperature (°C)	24.8	24.6	24.8	24.8	24.8	24.6
11.3%	pH (S.U.)	7.79	7.46	7.66	7.37	7.57	7.37
	DO (mg/L)	8.0	7.3	7.7	7.3	7.7	7.3
	Conductivity (µmhos/cm)	317		312		313	
	Temperature (°C)	25.0	24.6	24.9	24.9	24.9	24.8
22.6%	pH (S.U.)	7.74	7.44	7.62	7.35	7.56	7.33
	DO (mg/L)	8.0	7.4	7.8	7.1	7.9	7.2
	Conductivity (µmhos/cm)	299		293		296	
	Temperature (°C)	25.0	24.8	24.9	25.0	24.9	24.8
45.2%	pH (S.U.)	7.73	7.44	7.61	7.32	7.51	7.33
	DO (mg/L)	8.1	7.4	7.7	7.1	7.9	7.1
	Conductivity (µmhos/cm)	266		259		258	
	Temperature (°C)	25.1	24.9	24.9	25.0	24.9	24.9
72.6%	pH (S.U.)	7.70	7.43	7.59	7.29	7.48	7.33
	DO (mg/L)	8.1	7.3	7.7	7.0	7.9	7.1
	Conductivity (µmhos/cm)	225		221		222	
	Temperature (°C)	25.1	24.8	24.9	24.9	24.9	24.5
100%	pH (S.U.)	7.67	7.42	7.57	7.34	7.44	7.33
	DO (mg/L)	8.1	7.3	7.7	7.2	8.0	7.3
	Conductivity (µmhos/cm)	181		180		174	
	Alkalinity (mg $CaCO_3$/L)	96				66	
	Hardness (mg $CaCO_3$/L)	82				110	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.3	24.5	25.0	25.1	25.0	24.7
100% Intake	pH (S.U.)	7.57	7.43	7.57	7.34	7.42	7.33
	DO (mg/L)	8.3	7.6	7.8	7.2	8.1	7.4
	Conductivity (µmhos/cm)	170		179		172	
	Alkalinity (mg $CaCO_3$/L)	66				64	
	Hardness (mg $CaCO_3$/L)	82				69	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.7	25.0	25.1	24.8	24.7
		Initial	Final	Initial	Final	Initial	Final

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated **Date:** 11-17-09

		Day							
		3		4 KBK		KBK 5		6	
	Analyst	KBK	LAB	LAB	BSC	BSC	KBK	KBK	KBK
Concen-tration	**Parameter**								
CONTROL Non-treated	**pH** (S.U.)	7.71	7.56	7.55	7.20	7.42	7.23	7.79	7.24
	DO (mg/L)	7.8	7.7	7.9	7.5	7.8	6.9 ~~8.0~~	8.0	7.1
	Conductivity (µmhos/cm)	332		336		334		334	
	Alkalinity (mg $CaCO_3$/L)			62		62			
	Hardness (mg $CaCO_3$/L)			90		88			
	Temperature (°C)	24.7	24.8	24.7	24.6	24.7	24.6	24.8	24.8
11.3%	**pH** (S.U.)	7.73	7.50	7.68	7.18	7.57	7.20	7.62	7.15
	DO (mg/L)	8.2	7.6	8.1	7.4	7.8	~~8.0~~ 6.9	8.0	7.1
	Conductivity (µmhos/cm)	308		307		303		297	
	Temperature (°C)	24.7	24.5	24.8	24.8	24.7	24.8	24.8	24.8
22.6%	**pH** (S.U.)	7.72	7.50	7.65	7.17	7.53	7.11	7.61	7.14
	DO (mg/L)	8.2	7.6	8.0	7.3	7.9	6.3	8.1	6.8
	Conductivity (µmhos/cm)	288		296		286		280	
	Temperature (°C)	24.8	24.9	24.8	24.8	24.7	24.6	24.9	24.8
45.2%	**pH** (S.U.)	7.71	7.51	7.62	7.16	7.47	7.15	7.59	7.14
	DO (mg/L)	8.2	7.7	8.1	7.3	8.0	6.4	8.1	6.8
	Conductivity (µmhos/cm)	254		255		254		249	
	Temperature (°C)	25.0	24.9	24.8	24.7	24.7	24.6	24.9	24.7
72.6%	**pH** (S.U.)	7.67	7.51	7.60	7.23	7.41	7.15	7.56	7.04
	DO (mg/L)	8.2	7.8	8.3	7.4	8.2	6.6	8.2	6.9
	Conductivity (µmhos/cm)	217		213		217		211	
	Temperature (°C)	25.0	24.8	24.8	24.7	24.7	24.6	24.9	24.5
100%	**pH** (S.U.)	7.63	7.46	7.55	7.09	7.32	7.13	7.48	7.01
	DO (mg/L)	8.0	7.7	8.1	7.5	8.3	6.8	8.2	6.5
	Conductivity (µmhos/cm)	166		167		168		166	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			69					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	24.6	25.0	24.7	24.7	24.5	24.9	24.7
100% Intake	**pH** (S.U.)	7.64	7.49	7.52	7.07	7.26	7.04	7.47	7.01
	DO (mg/L)	8.2	7.9	8.1	7.5	8.4	6.5	8.2	6.5
	Conductivity (µmhos/cm)	164		167		167		163	
	Alkalinity (mg $CaCO_3$/L)			58					
	Hardness (mg $CaCO_3$/L)			73					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	24.6	25.0	24.6	24.9	24.6	24.9	24.7
		Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**	**Initial**	**Final**

ETS Environmental Testing Solutions, Inc.

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

Species: *Ceriodaphnia dubia*

Client: Tennessee Valley Authority **County:** Hamilton
Facility: Sequoyah Nuclear Plant **Outfall:** 101
NPDES #: TN0026450
Project #: 5812

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	565	1130	1815	2500	
Diluent volume (mL)	2217.5	1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism source information:											*Test information:*	
Organism age:	< 24-hours old										Randomizing template color:	ORANGE
Date and times organisms were born between:	11-17-09 0700 TO 1200										Incubator number and shelf location:	2B
Culture board:	11-10-09 A											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	11-05-09
Culture board cup number:	6	7	8	9	10	11	22	23	26	27		
Transfer vessel information:	pH = 7.59 S.U. Temperature = 25.0 °C										*Selenastrum* batch:	11-01-09
Average transfer volume (mL):	0.0375 mL											

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Sample numbers used Outfall 101	Sample numbers used Intake	Analyst
0	11-17-09	1500	11-12-09 A	091117.05	091117.06	JH
1	11-18-09	1413	11-12-09 A	091117.05	091117.06	JH
2	11-19-09	1400	11-12-09 B	091118.03	091118.04	JH
3	11-20-09	1411	11-12-09 B	091118.03	091118.04	JH
4	11-21-09	1405	11-17-09	091120.04	091120.05	JH
5	11-22-09	1418	11-19-09	091120.04	091120.05	JH
6	11-23-09	1410	11-19-09	091120.04	091120.05	JH
7	11-24-09	1402				JH

Control information:	Control-1	Control-2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC_{50}	>100%
% Adults having 3rd Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	29.5	29.8	≥ 15.0 offspring/female	ChV	>100%
% CV:	7.4%	5.4%	< 40.0 %	IC_{25}	>100%

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 **Date:** 11-17-09

CONTROL-1 ***Survival and Reproduction Data***

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	4	5	5	4	4	6	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	10	10	12	10	12	12	12	13	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	15	15	12	14	12	13	12	13	12	16
Total young produced		32	29	26	30	27	30	28	29	31	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.5

CONC: 11.3% ***Survival and Reproduction Data***

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

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.2
% Reduction from Control-1:	-2.4%

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 Date: 11-17-09
CONC: 22.6%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	5	4	4	6	4	4	4	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	11	12	12	12	12	11	13	13	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	14	16	13	16	14	16	17	15	13	18
Total young produced		32	32	29	32	32	32	32	32	32	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.9
% Reduction from Control-1:	-8.1%

CONC: 45.2%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	6	4	5	6	5	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	14	12	10	12	12	12	12	12	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	15	17	15	18	13	17	17	15
Total young produced		33	34	33	31	32	36	30	34	33	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.8
% Reduction from Control-1:	-11.2%

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 **Date:** 11-17-09

CONC: 72.6% ***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	4	6	6	4	6	5	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	14	12	13	13	13	14	11	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	16	17	16	14	18	16	19	15	14	17
Total young produced		33	34	34	32	37	33	38	34	30	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.7
% Reduction from Control-1:	-14.2%

CONC: 100% ***Survival and Reproduction Data***

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	6	5	6	5	5	7	5	6	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	12	10	13	13	12	15	11	14	14
	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	18	17	17	16	19	16	20	18	18
Total young produced		35	36	32	36	34	36	38	36	38	38
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	35.9
% Reduction from Control-1:	-21.7%

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 Date: 11-17-09

CONTROL-2 *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	6	4	4	5	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	9	12	12	11	13	12	13	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	14	12	16	13	12	15	13	15	14
Total young produced		31	27	30	32	28	30	31	30	31	28
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), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.8

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	6	5	4	4	4	5	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	12	11	12	12	13	12	12	12	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	19	17	17	14	13	16	15	15	15	16
Total young produced		38	35	33	30	29	33	32	31	31	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.5
% Reduction from Control-2:	-9.1%

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
November 17-24, 2009

Verification of *Ceriodaphnia* Reproduction Totals

Control-1

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	5	5	4	4	6	6	46
5	13	10	10	12	10	12	12	12	13	11	115
6	0	0	0	0	0	0	0	0	0	0	0
7	15	15	12	14	12	13	12	13	12	16	134
Total	32	29	26	30	27	30	28	29	31	33	295

11.3%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	4	5	5	4	4	4	43
5	11	13	12	13	13	12	12	10	12	12	120
6	0	0	0	0	0	0	0	0	0	0	0
7	16	14	12	14	13	13	13	14	13	17	139
Total	32	31	28	31	30	30	30	28	29	33	302

22.6%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	4	4	6	4	4	4	6	5	46
5	14	11	12	12	12	12	11	13	13	11	121
6	0	0	0	0	0	0	0	0	0	0	0
7	14	16	13	16	14	16	17	15	13	18	152
Total	32	32	29	32	32	32	32	32	32	34	319

45.2%

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	5	6	4	5	6	5	5	4	4	49
5	13	14	12	10	12	12	12	12	12	13	122
6	0	0	0	0	0	0	0	0	0	0	0
7	15	15	15	17	15	18	13	17	17	15	157
Total	33	34	33	31	32	36	30	34	33	32	328

72.6%

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	4	6	6	4	6	5	5	4	50
5	12	12	14	12	13	13	13	14	11	11	125
6	0	0	0	0	0	0	0	0	0	0	0
7	16	17	16	14	18	16	19	15	14	17	162
Total	33	34	34	32	37	33	38	34	30	32	337

100%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	6	5	6	5	5	7	5	6	6	56
5	14	12	10	13	13	12	15	11	14	14	128
6	0	0	0	0	0	0	0	0	0	0	0
7	16	18	17	17	16	19	16	20	18	18	175
Total	35	36	32	36	34	36	38	36	38	38	359

Control-2

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	6	4	4	5	4	4	4	4	43
5	13	9	12	12	11	13	12	13	12	10	117
6	0	0	0	0	0	0	0	0	0	0	0
7	14	14	12	16	13	12	15	13	15	14	138
Total	31	27	30	32	28	30	31	30	31	28	298

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	6	5	4	4	4	5	4	4	5	46
5	14	12	11	12	12	13	12	12	12	12	122
6	0	0	0	0	0	0	0	0	0	0	0
7	19	17	17	14	13	16	15	15	15	16	157
Total	38	35	33	30	29	33	32	31	31	33	325

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
November 17-24, 2009

Ceriodaphnia dubia Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1002.0

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

Project number: 5812

Reviewed by: [illegible]

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	32	29	26	30	27	30	28	29	31	33	100	29.5	7.4	Not applicable
11.3%	32	31	28	31	30	30	30	28	29	33	100	30.2	5.4	-2.4
22.6%	32	32	29	32	32	32	32	32	32	34	100	31.9	3.8	-8.1
45.2%	33	34	33	31	32	36	30	34	33	32	100	32.8	5.1	-11.2
72.6%	33	34	34	32	37	33	38	34	30	32	100	33.7	7.0	-14.2
100%	35	36	32	36	34	36	38	36	38	38	100	35.9	5.3	-21.7
Control - 2	31	27	30	32	28	30	31	30	31	28	100	29.8	5.4	Not applicable
100% Intake	38	35	33	30	29	33	32	31	31	33	100	32.5	8.0	-9.1

Outfall 101:
Dunnett's MSD value: 1.906
PMSD: 6.5

Intake:
Dunnett's MSD value: 1.676
PMSD: 5.6

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.
Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

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.

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
November 17-24, 2009
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/17/2009	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/24/2009	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
Control-1	32.000	29.000	26.000	30.000	27.000	30.000	28.000	29.000	31.000	33.000
Control-2	31.000	27.000	30.000	32.000	28.000	30.000	31.000	30.000	31.000	28.000
11.3	32.000	31.000	28.000	31.000	30.000	30.000	30.000	28.000	29.000	33.000
22.6	32.000	32.000	29.000	32.000	32.000	32.000	32.000	32.000	32.000	34.000
45.2	33.000	34.000	33.000	31.000	32.000	36.000	30.000	34.000	33.000	32.000
72.6	33.000	34.000	34.000	32.000	37.000	33.000	38.000	34.000	30.000	32.000
100	35.000	36.000	32.000	36.000	34.000	36.000	38.000	36.000	38.000	38.000
Intake	38.000	35.000	33.000	30.000	29.000	33.000	32.000	31.000	31.000	33.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
Control-1	29.500	0.9899	29.500	26.000	33.000	7.366	10			32.333	1.0000
Control-2	29.800	1.0000	29.800	27.000	32.000	5.434	10				
11.3	30.200	1.0134	30.200	28.000	33.000	5.362	10	115.00	75.00	32.333	1.0000
22.6	31.900	1.0705	31.900	29.000	34.000	3.753	10	137.00	75.00	32.333	1.0000
45.2	32.800	1.1007	32.800	30.000	36.000	5.142	10	144.00	75.00	32.333	1.0000
72.6	33.700	1.1309	33.700	30.000	38.000	7.001	10	147.00	75.00	32.333	1.0000
100	35.900	1.2047	35.900	32.000	38.000	5.326	10	153.50	75.00	32.333	1.0000
Intake	32.500	1.0906	32.500	29.000	38.000	7.978	10				

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.045023799	1.035	0.04119118	0.090545302
Bartlett's Test indicates equal variances (p = 0.46)	4.634984493	15.08627224		
The control means are not significantly different (p = 0.73)	0.350059429	2.100922029		

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

Linear Interpolation (200 Resamples)

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

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
November 17-24, 2009

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Used for PMSD calculation only. Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/17/2009	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/24/2009	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
Control-1	32.000	29.000	26.000	30.000	27.000	30.000	28.000	29.000	31.000	33.000
Control-2	31.000	27.000	30.000	32.000	28.000	30.000	31.000	30.000	31.000	28.000
11.3	32.000	31.000	28.000	31.000	30.000	30.000	30.000	28.000	29.000	33.000
22.6	32.000	32.000	29.000	32.000	32.000	32.000	32.000	32.000	32.000	34.000
45.2	33.000	34.000	33.000	31.000	32.000	36.000	30.000	34.000	33.000	32.000
72.6	33.000	34.000	34.000	32.000	37.000	33.000	38.000	34.000	30.000	32.000
100	35.000	36.000	32.000	36.000	34.000	36.000	38.000	36.000	38.000	38.000
Intake	38.000	35.000	33.000	30.000	29.000	33.000	32.000	31.000	31.000	33.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control-1	29.500	0.9899	29.500	26.000	33.000	7.366	10			
Control-2	29.800	1.0000	29.800	27.000	32.000	5.434	10			
11.3	30.200	1.0134	30.200	28.000	33.000	5.362	10	-0.840	2.287	1.906
22.6	31.900	1.0705	31.900	29.000	34.000	3.753	10	-2.879	2.287	1.906
45.2	32.800	1.1007	32.800	30.000	36.000	5.142	10	-3.959	2.287	1.906
72.6	33.700	1.1309	33.700	30.000	38.000	7.001	10	-5.039	2.287	1.906
100	35.900	1.2047	35.900	32.000	38.000	5.326	10	-7.678	2.287	1.906
Intake	32.500	1.0906	32.500	29.000	38.000	7.978	10			

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.045023799	1.035	0.04119118	0.090545302
Bartlett's Test indicates equal variances (p = 0.46)	4.634984493	15.08627224		
The control means are not significantly different (p = 0.73)	0.350059429	2.100922029		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	1.906063607	0.064612326	55.14666667	3.474074074	1.3E-09	5, 54
Treatments vs Control-1										

TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
Non-treated
November 17-24, 2009

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/17/2009	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
End Date:	11/24/2009	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
Control-1	32.000	29.000	26.000	30.000	27.000	30.000	28.000	29.000	31.000	33.000
Control-2	31.000	27.000	30.000	32.000	28.000	30.000	31.000	30.000	31.000	28.000
11.3	32.000	31.000	28.000	31.000	30.000	30.000	30.000	28.000	29.000	33.000
22.6	32.000	32.000	29.000	32.000	32.000	32.000	32.000	32.000	32.000	34.000
45.2	33.000	34.000	33.000	31.000	32.000	36.000	30.000	34.000	33.000	32.000
72.6	33.000	34.000	34.000	32.000	37.000	33.000	38.000	34.000	30.000	32.000
100	35.000	36.000	32.000	36.000	34.000	36.000	38.000	36.000	38.000	38.000
Intake	38.000	35.000	33.000	30.000	29.000	33.000	32.000	31.000	31.000	33.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control-1	29.500	0.9899	29.500	26.000	33.000	7.366	10			
Control-2	29.800	1.0000	29.800	27.000	32.000	5.434	10			
11.3	30.200	1.0134	30.200	28.000	33.000	5.362	10			
22.6	31.900	1.0705	31.900	29.000	34.000	3.753	10			
45.2	32.800	1.1007	32.800	30.000	36.000	5.142	10			
72.6	33.700	1.1309	33.700	30.000	38.000	7.001	10			
100	35.900	1.2047	35.900	32.000	38.000	5.326	10			
Intake	32.500	1.0906	32.500	29.000	38.000	7.978	10	-2.793	1.734	1.676

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.951577842	0.868	0.62319944	1.12773217
F-Test indicates equal variances (p = 0.18)	2.563559294	6.541089535		
The control means are not significantly different (p = 0.73)	0.350059429	2.100922029		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs Control-2	1.676261504	0.056250386	36.45	4.672222222	0.0120129	1, 18

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
November 17-27, 2009

ETS
Environmental Testing Solutions, Inc.

Ceriodaphnia dubia Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1002.0

Daily Chemical Analyses

Project number: 5812

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)	7.48	7.58	7.63	7.54	7.50	7.71	7.71	7.68	7.55	7.54	7.42	7.57	7.79	7.51
	DO (mg/L)	7.8	7.8	7.6	7.7	7.7	8.0	7.8	8.1	7.9	8.1	7.8	8.0	8.0	7.8
	Conductivity (µmhos/cm)	325		332		328		332		336		334		334	
	Alkalinity (mg/L $CaCO_3$)	61				62				62		62			
	Hardness (mg/L $CaCO_3$)	90				90				90		88			
	Temperature (°C)	24.9	24.9	24.9	24.9	24.8	25.1	24.6	24.9	24.7	25.0	24.7	24.9	24.8	25.3
11.3%	pH (SU)	7.79	7.57	7.66	7.56	7.57	7.71	7.73	7.68	7.68	7.54	7.57	7.58	7.62	7.52
	DO (mg/L)	8.0	7.7	7.7	7.6	7.7	8.1	8.2	8.1	8.1	8.0	7.8	8.1	8.0	7.8
	Conductivity (µmhos/cm)	317		317		313		308		307		303		297	
	Temperature (°C)	24.9	24.9	24.9	25.0	24.9	25.1	24.9	24.9	24.7	25.0	24.7	25.2	24.9	25.1
22.6%	pH (SU)	7.74	7.57	7.62	7.55	7.56	7.71	7.72	7.68	7.65	7.54	7.53	7.59	7.61	7.52
	DO (mg/L)	8.0	7.7	7.8	7.5	7.9	8.1	8.2	8.1	8.0	8.0	7.9	8.1	8.1	7.8
	Conductivity (µmhos/cm)	299		293		296		288		296		286		280	
	Temperature (°C)	25.0	25.0	24.9	25.0	24.9	25.1	24.9	25.0	24.7	25.0	24.7	25.0	24.9	25.0
45.2%	pH (SU)	7.73	7.56	7.61	7.54	7.51	7.71	7.71	7.66	7.62	7.53	7.47	7.58	7.59	7.51
	DO (mg/L)	8.1	7.8	7.7	7.6	7.9	8.1	8.2	8.2	8.1	7.9	8.0	8.0	8.1	7.8
	Conductivity (µmhos/cm)	266		259		258		254		255		254		249	
	Temperature (°C)	25.0	25.0	24.9	25.1	24.9	25.0	25.0	24.9	24.7	24.9	24.7	25.0	24.9	25.2
72.6%	pH (SU)	7.70	7.56	7.59	7.54	7.48	7.69	7.67	7.65	7.60	7.52	7.41	7.56	7.56	7.48
	DO (mg/L)	8.1	7.8	7.7	7.6	7.9	8.0	8.2	8.2	8.3	7.9	8.2	8.0	8.2	7.8
	Conductivity (µmhos/cm)	225		221		222		217		213		217		211	
	Temperature (°C)	25.0	24.8	24.9	24.9	25.0	24.8	25.0	25.1	24.8	24.9	24.8	25.1	24.9	24.9
100%	pH (SU)	7.67	7.56	7.57	7.54	7.44	7.66	7.63	7.62	7.55	7.48	7.32	7.54	7.48	7.46
	DO (mg/L)	8.1	7.8	7.7	7.6	8.0	8.0	8.0	8.2	8.1	7.9	8.3	8.1	8.2	7.9
	Conductivity (µmhos/cm)	181		180		174		166		167		168		166	
	Alkalinity (mg/L $CaCO_3$)	96				66				62					
	Hardness (mg/L $CaCO_3$)	82				110				69					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.8	24.9	25.1	25.0	25.2	25.2	24.8	24.9	24.8	24.8	25.1	24.9	25.2
100% Intake	pH (SU)	7.57	7.55	7.57	7.54	7.42	7.66	7.64	7.63	7.52	7.49	7.26	7.56	7.47	7.46
	DO (mg/L)	8.3	7.9	7.8	7.6	8.1	8.0	8.2	8.0	8.1	8.0	8.4	8.1	8.2	8.0
	Conductivity (µmhos/cm)	178		179		172		164		167		167		163	
	Alkalinity (mg/L $CaCO_3$)	66				64				58					
	Hardness (mg/L $CaCO_3$)	82				69				73					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.9	24.8	24.9	25.0	25.0	25.0	25.0	24.8	24.9	25.0	25.0	24.9	25.0	25.2

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia* **Date:** 11-17-09

Client: TVA / Sequoyah Nuclear Plant, Outfall 101

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KW	KW	KW	UAB	UAB	KW
Concentration	Parameter						
CONTROL	pH (S.U.)	7.48	7.58	7.63	7.54	7.50	7.71
	DO (mg/L)	7.8	7.8	7.6	7.7	7.7	8.0
	Conductivity (µmhos/cm)	325		332		328	
	Alkalinity (mg $CaCO_3$/L)	61				62	
	Hardness (mg $CaCO_3$/L)	90				90	
	Temperature (°C)	24.9	24.9	24.9	24.9	24.8	25.1
11.3%	pH (S.U.)	7.79	7.57	7.66	7.56	7.57	7.71
	DO (mg/L)	8.0	7.7	7.7	7.6	7.7	8.1
	Conductivity (µmhos/cm)	317		~~630~~ 317		313	
	Temperature (°C)	24.9	24.9	24.9	25.0	24.9	25.1
22.6%	pH (S.U.)	7.74	7.57	7.62	7.55	7.56	7.71
	DO (mg/L)	8.0	7.7	7.8	7.5	7.9	8.1
	Conductivity (µmhos/cm)	299		~~690~~ 293		296	
	Temperature (°C)	25.0	25.0	24.9	25.0	24.9	25.1
45.2%	pH (S.U.)	7.73	7.56	7.61	7.54	7.51	7.71
	DO (mg/L)	8.1	7.8	7.7	7.6	7.9	8.1
	Conductivity (µmhos/cm)	266		~~837~~ 257		258	
	Temperature (°C)	25.0	25.0	24.9	25.1	24.9	25.0
72.6%	pH (S.U.)	7.70	7.56	7.59	7.54	7.48	7.69
	DO (mg/L)	8.1	7.8	7.7	7.6	7.9	8.0
	Conductivity (µmhos/cm)	225		~~104~~ 221		222	
	Temperature (°C)	25.0	24.8	24.9	24.9	25.0	24.8
100%	pH (S.U.)	7.67	7.56	7.57	7.54	7.44	7.66
	DO (mg/L)	8.1	7.8	7.7	7.6	8.0	8.0
	Conductivity (µmhos/cm)	181		180		~~86~~ 174	
	Alkalinity (mg $CaCO_3$/L)	96				66	
	Hardness (mg $CaCO_3$/L)	82				110	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.8	24.9	25.1	25.0	25.2
100% Intake	pH (S.U.)	7.57	7.55	7.57	7.54	7.42	7.66
	DO (mg/L)	8.3	7.9	7.8	7.6	8.1	8.0
	Conductivity (µmhos/cm)	170		179		172	
	Alkalinity (mg $CaCO_3$/L)	66				64	
	Hardness (mg $CaCO_3$/L)	82				69	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.9	24.8	24.9	25.0	25.0	25.0
		Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 **Date:** 11-17-09

		Day							
		3		4		5		6	
	Analyst	KW	LAB	LAB	BSL	BSL	KW	KW	KW
Concentration	Parameter								
CONTROL	pH (S.U.)	7.71	7.68	7.55	7.54	7.42	7.57	7.79	7.51
	DO (mg/L)	7.8	8.1	7.9	8.1	7.8	8.0	8.0	7.8
	Conductivity (µmhos/cm)	332		336		334		334	
	Alkalinity (mg $CaCO_3$/L)			62		62			
	Hardness (mg $CaCO_3$/L)			90		88			
	Temperature (°C)	24.6	24.9	24.7	25.0	24.7	24.9	24.8	25.3
11.3%	pH (S.U.)	7.73	7.68	7.68	7.54	7.57	7.58	7.62	7.52
	DO (mg/L)	8.2	8.1	8.1	8.0	7.8	8.1	8.0	7.8
	Conductivity (µmhos/cm)	308		307		303		297	
	Temperature (°C)	24.9	24.9	24.7	25.0	24.7	25.2	24.9	25.1
22.6%	pH (S.U.)	7.72	7.68	7.65	7.54	7.53	7.59	7.61	7.52
	DO (mg/L)	8.2	8.1	8.0	8.0	7.9	8.1	8.1	7.8
	Conductivity (µmhos/cm)	288		296		286		280	
	Temperature (°C)	24.9	25.0	24.7	25.0	24.7	25.0	24.9	25.0
45.2%	pH (S.U.)	7.71	7.66	7.62	7.53	7.47	7.58	7.59	7.51
	DO (mg/L)	8.2	8.2	8.1	7.8	8.0	8.0	8.1	7.8
	Conductivity (µmhos/cm)	254		255		254		249	
	Temperature (°C)	25.0	24.9	24.7	24.9	24.7	25.0	24.9	25.2
72.6%	pH (S.U.)	7.67	7.65	7.60	7.52	7.41	7.56	7.56	7.48
	DO (mg/L)	8.2	8.2	8.3	7.9	8.2	8.0	8.2	7.8
	Conductivity (µmhos/cm)	217		213		217		211	
	Temperature (°C)	25.0	25.1	24.8	24.9	24.8	25.1	24.9	24.9
100%	pH (S.U.)	7.63	7.62	7.55	7.48	7.32	7.54	7.48	7.46
	DO (mg/L)	8.0	8.2	8.1	7.9	8.3	8.1	8.2	7.9
	Conductivity (µmhos/cm)	166		167		168		166	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			69					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.8	24.9	24.8	24.8	25.1	24.9	25.2
100% Intake	pH (S.U.)	7.64	7.63	7.52	7.49	7.26	7.56	7.47	7.46
	DO (mg/L)	8.2	8.0	8.1	8.0	8.4	8.1	8.2	8.0
	Conductivity (µmhos/cm)	164		167		167		163	
	Alkalinity (mg $CaCO_3$/L)			58					
	Hardness (mg $CaCO_3$/L)			73					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	24.8	24.9	25.0	25.0	24.9	25.0	25.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

ETS
Environmental Testing Solutions, Inc.

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

Species: *Pimephales promelas*

Client: Tennessee Valley Authority
Facility: Sequoyah Nuclear Plant
NPDES #: ~~TN0020168~~ TN0026450
Project #: 5812

County: ~~Rhea~~ HAMILTON
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	Each concentration was UV-treated
Effluent volume (mL)	282.5	565	1130	1815	2500	for 2 minutes to remove pathogenic
Diluent volume (mL)	2217.5	1935	1370	685	0	Interferences.
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	22.50 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	11-16-09 1600	Incubator number and shelf location:	3B
Organism source:	ATOX BATCH PP 11-16-09	*Artemia* CHM number:	CHM444
		Drying information for weight determination:	
Transfer bowl information:	pH = 7.50 S.U. Temperature = 24.7°C	Date / Time in oven:	11-24-09 1350
		Initial oven temperature:	60°C
Average transfer volume:	0.2305 ml	Date / Time out of oven:	11-25-09 1350
		Final oven temperature:	60°C
		Total drying time:	24 HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding		Afternoon feeding		Test initiation, renewal, or termination		Sample numbers used		MHSW batch used
		Time	Analyst	Time	Analyst	Time	Analyst	Outfall 101	Intake	
0	11-17-09	—	—	1600	JH	1430	JH	091117.05	091117.06	11-12-09 A
1	11-18-09	0800	JH	1400	JH	1332	JH	091117.05	091117.06	11-12-09 A
2	11-19-09	0800	JH	1400	JH	1330	JH	091118.03	091118.04	11-12-09 B
3	11-20-09	0800	JH	1400	JH	1333	JH	091118.03	091118.04	11-12-09 B
4	11-21-09	0800	JH	1400	JH	1330	JH	091120.04	091120.05	11-17-09
5	11-22-09	0800	JH	1400	JH	1334	JH	091120.04	091120.05	11-19-09
6	11-23-09	0800	JH	1400	JH	1332	JH	091120.04	091120.05	11-19-09
7	11-24-09					1331	JH			

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.802	
Average weight per surviving larvae:	0.802	≥ 0.25mg/larvae

Summary of test endpoints:	
7-day LC_{50}	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC_{25}	>100%

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 11-17-09

Survival and Growth Data

Day	CONTROL UV-treated				11.3%				22.6%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	9[d]	10	10	10	10	10
7	10	10	10	10	10	10	9	10	10	10	10	10
A = Pan weight (mg) Tray color code:: Navy Analyst: KJS Date: 10-25-09	14.32	14.17	12.74	14.11	14.06	14.05	15.70	14.43	13.63	14.15	12.46	13.82
B = Pan + Larvae weight (mg) Analyst: KJS Date: 12-01-09	22.80	22.15	20.46	22.81	22.82	22.62	23.34	21.98	21.12	22.11	21.00	21.88
C = Larvae weight (mg) = B – A	8.48	7.18	7.72	8.70	8.76	8.57	7.64	7.55	7.49	7.96	8.54	8.06
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.848	0.718	0.772	0.870	0.876	0.857	0.764	0.755	0.749	0.796	0.854	0.806
Average weight per initial number of larvae (mg)	0.802				0.813				0.801			
Percent reduction from control (%)							-1.47.				0.17.	

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:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 11-17-09

Survival and Growth Data

Day	45.2%				72.6%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10 lg	10
A = Pan weight (mg) Tray color code:: Navy Analyst: KLS Date: 10-25-09	13.84	13.27	14.92	13.36	13.35	13.47	14.87	13.07	13.18	14.61	14.66	15.39
B = Pan + Larvae weight (mg) Analyst: [illegible] Date: 12-01-09	21.08	21.43	23.17	22.01	22.25	21.22	23.43	21.21	20.93	22.18	24.05	24.06
C = Larvae weight (mg) = B – A	7.24	8.16	8.25	8.65	8.90	7.75	8.56	8.14	7.75	7.57	9.39	8.67
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.724	0.816	0.825	0.865	0.890	0.775	0.856	0.814	0.775	0.757	0.939	0.867
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.808		-0.7%		0.834		-4.0%		0.835		-4.1%	

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

Calculations and data reviewed: [illegible]

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 11-17-09

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg) Tray color code:: Navy Analyst: KLS Date: 10-29-09	15.40	13.16	15.73	12.86
B = Pan + Larvae weight (mg) Analyst: MLS Date: Nov 12-01-09	23.53	20.42	23.53	20.56
C = Larvae weight (mg) = B – A	8.13	7.26	7.80	7.70
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.813	0.726	0.780	0.770
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.772		3.7%	

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

Calculations and data reviewed: JL

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
November 17-24, 2009

ETS
Environmental Testing Solutions, Inc.

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

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

Project number: 5812
Reveiwed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Not for Compliance Assessment, Internal Laboratory QC: 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	14.32	22.80	8.48	0.848	0.802	8.7	0.848	100.0	0.802	8.7	Not applicable
	B	10	10	14.97	22.15	7.18	0.718			0.718				
	C	10	10	12.74	20.46	7.72	0.772			0.772				
	D	10	10	14.11	22.81	8.70	0.870			0.870				
11.3%	E	10	10	14.06	22.82	8.76	0.876	0.834	6.5	0.876	97.5	0.813	7.7	-1.4
	F	10	10	14.05	22.62	8.57	0.857			0.857				
	G	10	9	15.70	23.34	7.64	0.849			0.764				
	H	10	10	14.43	21.98	7.55	0.755			0.755				
22.6%	I	10	10	13.63	21.12	7.49	0.749	0.801	5.4	0.749	100.0	0.801	5.4	0.1
	J	10	10	14.15	22.11	7.96	0.796			0.796				
	K	10	10	12.46	21.00	8.54	0.854			0.854				
	L	10	10	13.82	21.88	8.06	0.806			0.806				
45.2%	M	10	10	13.84	21.08	7.24	0.724	0.808	7.4	0.724	100.0	0.808	7.4	-0.7
	N	10	10	13.27	21.43	8.16	0.816			0.816				
	O	10	10	14.92	23.17	8.25	0.825			0.825				
	P	10	10	13.36	22.01	8.65	0.865			0.865				
72.6%	Q	10	10	13.35	22.25	8.90	0.890	0.834	6.0	0.890	100.0	0.834	6.0	-4.0
	R	10	10	13.47	21.22	7.75	0.775			0.775				
	S	10	10	14.87	23.43	8.56	0.856			0.856				
	T	10	10	13.07	21.21	8.14	0.814			0.814				
100%	U	10	10	13.18	20.93	7.75	0.775	0.835	10.1	0.775	100.0	0.835	10.1	-4.1
	V	10	10	14.61	22.18	7.57	0.757			0.757				
	W	10	10	14.66	24.05	9.39	0.939			0.939				
	X	10	10	15.39	24.06	8.67	0.867			0.867				
100% Intake	Y	10	10	15.40	23.53	8.13	0.813	0.772	4.6	0.813	100.0	0.772	4.6	3.7
	Z	10	10	13.16	20.42	7.26	0.726			0.726				
	AA	10	10	15.73	23.53	7.80	0.780			0.780				
	BB	10	10	12.86	20.56	7.70	0.770			0.770				

Outfall 101:
Dunnett's MSD value: 0.1075
PMSD: 13.4

Intake:
Dunnett's MSD value: 0.0764
PMSD: 9.5

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.

Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.
Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
November 17-24, 2009
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/17/2009	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	11/24/2009	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	0.8480	0.7180	0.7720	0.8700
11.3	0.8760	0.8570	0.7640	0.7550
22.6	0.7490	0.7960	0.8540	0.8060
45.2	0.7240	0.8160	0.8250	0.8650
72.6	0.8900	0.7750	0.8560	0.8140
100	0.7750	0.7570	0.9390	0.8670
Intake	0.8130	0.7260	0.7800	0.7700

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8020	1.0000	0.8020	0.7180	0.8700	8.727	4				0.8153	1.0000
11.3	0.8130	1.0137	0.8130	0.7550	0.8760	7.672	4	-0.247	2.410	0.1075	0.8153	1.0000
22.6	0.8013	0.9991	0.8013	0.7490	0.8540	5.374	4	0.017	2.410	0.1075	0.8153	1.0000
45.2	0.8075	1.0069	0.8075	0.7240	0.8650	7.381	4	-0.123	2.410	0.1075	0.8153	1.0000
72.6	0.8338	1.0396	0.8338	0.7750	0.8900	5.997	4	-0.712	2.410	0.1075	0.8153	1.0000
100	0.8345	1.0405	0.8345	0.7570	0.9390	10.150	4	-0.729	2.410	0.1075	0.8153	1.0000
Intake	0.7723	0.9629	0.7723	0.7260	0.8130	4.648	4					

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.939999402	0.884	-0.02446093	-1.22636643
Bartlett's Test indicates equal variances (p = 0.91)	1.50255847	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	0.107485809	0.134022205	0.000919567	0.003978306	0.943894863	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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

TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
UV-treated
November 17-24, 2009

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/17/2009	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
End Date:	11/24/2009	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	0.8480	0.7180	0.7720	0.8700
11.3	0.8760	0.8570	0.7640	0.7550
22.6	0.7490	0.7960	0.8540	0.8060
45.2	0.7240	0.8160	0.8250	0.8650
72.6	0.8900	0.7750	0.8560	0.8140
100	0.7750	0.7570	0.9390	0.8670
Intake	0.8130	0.7260	0.7800	0.7700

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.8020	1.0000	0.8020	0.7180	0.8700	8.727	4			
11.3	0.8130	1.0137	0.8130	0.7550	0.8760	7.672	4			
22.6	0.8013	0.9991	0.8013	0.7490	0.8540	5.374	4			
45.2	0.8075	1.0069	0.8075	0.7240	0.8650	7.381	4			
72.6	0.8338	1.0396	0.8338	0.7750	0.8900	5.997	4			
100	0.8345	1.0405	0.8345	0.7570	0.9390	10.150	4			
Intake	0.7723	0.9629	0.7723	0.7260	0.8130	4.648	4	0.756	1.943	0.0764

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96844363	0.749	-0.33306569	-0.81375687
F-Test indicates equal variances (p = 0.30)	3.80257463	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	0.07642232	0.09528968	0.001770125	0.003093458	0.478019476	1, 6

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
November 17-24, 2009

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Whole Effluent Toxicity Test
EPA-821-R-02-013, Method 1000.0

Daily Chemical Analyses

Project number: 5812
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)	7.65	7.50	7.61	7.39	7.58	7.41	7.68	7.53	7.62	7.22	7.53	7.19	7.61	7.19
	DO (mg/L)	8.0	7.7	7.9	7.4	7.9	7.3	8.2	8.1	7.9	7.3	8.0	6.9	7.9	6.4
	Conductivity (µmhos/cm)	332		330		321		320		320		312		313	
	Alkalinity (mg/L $CaCO_3$)	61				62				61		61			
	Hardness (mg/L $CaCO_3$)	90				88				90		86			
	Temperature (°C)	25.0	24.8	24.9	24.7	24.7	24.9	24.8	24.7	24.8	24.9	24.8	24.8	24.7	24.7
11.3%	pH (SU)	7.64	7.48	7.63	7.39	7.59	7.39	7.68	7.51	7.63	7.16	7.54	7.19	7.61	7.18
	DO (mg/L)	7.7	7.6	8.0	7.3	7.9	7.4	8.0	7.6	7.8	7.3	7.9	7.0	8.0	6.9
	Conductivity (µmhos/cm)	311		312		307		308		310		304		301	
	Temperature (°C)	25.1	24.6	24.9	24.9	24.9	25.0	25.0	24.8	24.8	24.6	24.8	24.8	24.9	24.7
22.6%	pH (SU)	7.63	7.49	7.63	7.40	7.57	7.38	7.69	7.52	7.62	7.16	7.53	7.18	7.60	7.18
	DO (mg/L)	7.8	7.6	8.0	7.3	7.9	7.1	8.0	7.7	7.9	7.2	7.9	7.1	8.1	7.1
	Conductivity (µmhos/cm)	299		296		293		292		292		290		291	
	Temperature (°C)	25.1	24.6	25.0	24.9	24.9	24.8	25.0	24.8	24.8	24.6	24.8	24.8	24.9	24.7
45.2%	pH (SU)	7.61	7.49	7.62	7.37	7.53	7.36	7.68	7.48	7.60	7.16	7.49	7.19	7.59	7.15
	DO (mg/L)	7.9	7.5	8.0	7.2	7.9	7.1	8.1	7.7	7.9	7.3	7.9	7.0	8.1	7.0
	Conductivity (µmhos/cm)	264		262		261		259		273		270		266	
	Temperature (°C)	25.2	24.7	25.0	24.8	25.0	24.8	25.0	24.8	24.8	24.8	24.8	24.7	24.9	24.7
72.6%	pH (SU)	7.59	7.47	7.62	7.35	7.49	7.34	7.65	7.48	7.53	7.11	7.43	7.19	7.57	7.15
	DO (mg/L)	8.0	7.4	8.0	7.2	8.0	7.3	8.1	7.7	7.8	7.3	8.0	6.8	8.1	6.9
	Conductivity (µmhos/cm)	220		223		218		214		217		217		215	
	Temperature (°C)	25.2	24.7	25.0	24.8	25.0	25.0	25.0	24.6	24.8	24.8	25.0	24.6	25.0	24.9
100%	pH (SU)	7.56	7.44	7.57	7.38	7.44	7.30	7.62	7.47	7.51	7.09	7.37	7.16	7.52	7.13
	DO (mg/L)	8.0	7.6	8.0	7.3	8.0	7.1	8.1	7.8	8.0	7.3	8.0	6.9	8.2	6.9
	Conductivity (µmhos/cm)	181		181		171		171		169		169		170	
	Alkalinity (mg/L $CaCO_3$)	68				62				58					
	Hardness (mg/L $CaCO_3$)	78				78				65					
	Temperature (°C)	25.3	24.7	25.2	24.8	25.0	24.8	25.2	24.7	24.9	24.7	25.0	24.9	25.1	24.7
100% Intake	pH (SU)	7.49	7.44	7.60	7.37	7.44	7.31	7.61	7.47	7.51	7.10	7.37	7.07	7.52	7.09
	DO (mg/L)	8.3	7.7	8.0	7.3	8.1	7.3	8.2	7.8	8.0	7.2	8.2	6.9	8.2	6.9
	Conductivity (µmhos/cm)	181		189		168		169		160		164		168	
	Alkalinity (mg/L $CaCO_3$)	66				60				64					
	Hardness (mg/L $CaCO_3$)	78				69				69					
	Temperature (°C)	25.2	24.5	25.0	24.8	25.0	24.8	25.1	24.6	25.1	24.7	24.9	24.6	24.9	24.8

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** **Date:** 11-17-09
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated**
Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KLK	KLK	KLK	LAB	LAB	KLK
Concentration	Parameter						
CONTROL UV-treated	pH (S.U.)	7.65	7.50	7.61	7.39	7.58	7.41
	DO (mg/L)	8.0	7.7	7.9	7.4	7.9	7.3
	Conductivity (µmhos/cm)	332		330		321	
	Alkalinity (mg $CaCO_3$/L)	61				62	
	Hardness (mg $CaCO_3$/L)	90				88	
	Temperature (°C)	25.0	24.8	24.9	24.7	24.7	24.9
11.3%	pH (S.U.)	7.64	7.48	7.63	7.39	7.59	7.39
	DO (mg/L)	7.7	7.6	8.0	7.3	7.9	7.4
	Conductivity (µmhos/cm)	311		312		307	
	Temperature (°C)	25.1	24.6	24.9	24.9	24.9	25.0
22.6%	pH (S.U.)	7.63	7.49	7.63	7.40	7.57	7.38
	DO (mg/L)	7.8	7.6	8.0	7.3	7.9	7.1
	Conductivity (µmhos/cm)	299		296		293	
	Temperature (°C)	25.1	24.6	25.0	24.9	24.9	24.8
45.2%	pH (S.U.)	7.61	7.49	7.62	7.37	7.53	7.36
	DO (mg/L)	7.9	7.5	8.0	7.2	7.9	7.1
	Conductivity (µmhos/cm)	264		262		261	
	Temperature (°C)	25.2	24.7	25.0	24.8	25.0	24.8
72.6%	pH (S.U.)	7.59	7.47	7.62	7.35	7.49	7.34
	DO (mg/L)	8.0	7.4	8.0	7.2	8.0	7.3
	Conductivity (µmhos/cm)	220		223		218	
	Temperature (°C)	25.2	24.7	25.0	24.8	25.0	25.0
100%	pH (S.U.)	7.56	7.44	7.57	7.38	7.44	7.30
	DO (mg/L)	8.0	7.6	8.0	7.3	8.0	7.1
	Conductivity (µmhos/cm)	181		181		171	
	Alkalinity (mg $CaCO_3$/L)	68				62	
	Hardness (mg $CaCO_3$/L)	78				78	
NON TREATED →	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.3	24.7	25.2	24.8	25.0	24.8
100% Intake	pH (S.U.)	7.49	7.44	7.60	7.37	7.44	7.31
	DO (mg/L)	8.3	7.7	8.0	7.3	8.1	7.3
	Conductivity (µmhos/cm)	181		189		168	
	Alkalinity (mg $CaCO_3$/L)	66				60	
	Hardness (mg $CaCO_3$/L)	78				69	
NON TREATED →	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.2	24.5	25.0	24.8	25.0	24.8
		Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated **Date:** 11-17-09

		Day							
		3		4 KLK		KLK 5		6	
	Analyst	KLK	LAB	LAB	BSC	BSC	KLK	KLK	KLK
Concentration	Parameter								
CONTROL UV-treated	pH (S.U.)	7.68	7.53	7.62	7.22	7.53	7.19	7.61	7.19
	DO (mg/L)	8.2	8.1	7.9	7.3	8.0	6.9	7.9	6.4
	Conductivity (µmhos/cm)	320		320		312		313	
	Alkalinity (mg $CaCO_3$/L)			61		61			
	Hardness (mg $CaCO_3$/L)			90		86			
	Temperature (°C)	24.8	24.7	24.8	24.9	24.8	24.8	24.7	24.7
11.3%	pH (S.U.)	7.68	7.51	7.63	7.16	7.54	7.19	7.61	7.18
	DO (mg/L)	8.0	7.6	7.8	7.3	7.9	7.0	8.0	6.9
	Conductivity (µmhos/cm)	308		310		304		301	
	Temperature (°C)	25.0	24.8	24.8	24.6	24.8	24.8	24.9	24.7
22.6%	pH (S.U.)	7.69	7.52	7.62	7.16	7.53	7.18	7.60	7.18
	DO (mg/L)	8.0	7.7	7.9	7.2	7.9	7.1	8.1	7.1
	Conductivity (µmhos/cm)	292		292		290		291	
	Temperature (°C)	25.0	24.8	24.8	24.6	24.8	24.8	24.9	24.7
45.2%	pH (S.U.)	7.68	7.48	7.60	7.16	7.49	7.19	7.59	7.15
	DO (mg/L)	8.1	7.7	7.9	7.3	7.9	7.0	8.1	7.0
	Conductivity (µmhos/cm)	259		273		270		266	
	Temperature (°C)	25.0	24.8	24.8	24.8	24.8	24.7	24.9	24.7
72.6%	pH (S.U.)	7.65	7.48	7.53	7.11	7.43	7.19	7.57	7.15
	DO (mg/L)	8.1	7.7	7.8	7.3	8.0	6.9	8.1	6.9
	Conductivity (µmhos/cm)	214		217		217		215	
	Temperature (°C)	25.0	24.6	24.8	24.8	25.0	24.6	25.0	24.9
100% NON-TREATED	pH (S.U.)	7.62	7.47	7.51	7.09	7.37	7.16	7.52	7.13
	DO (mg/L)	8.1	7.8	8.0	7.3	8.0	6.9	8.2	6.9
	Conductivity (µmhos/cm)	171		169		169		170	
	Alkalinity (mg $CaCO_3$/L)			58					
	Hardness (mg $CaCO_3$/L)			65					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.7	24.9	24.7	25.0	24.9	25.1	24.7
100% Intake NON-TREATED	pH (S.U.)	7.61	7.47	7.51	7.10	7.37	7.07	7.52	7.09
	DO (mg/L)	8.2	7.8	8.0	7.2	8.2	6.9	8.2	6.9
	Conductivity (µmhos/cm)	169		160		164		168	
	Alkalinity (mg $CaCO_3$/L)			64					
	Hardness (mg $CaCO_3$/L)			69					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.1	24.6	25.1	24.7	24.9	24.6	24.9	24.8
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

ETS
Environmental Testing Solutions, Inc.

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

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

Analyst	UAB	Iodide reagent:	INR357
Date analyzed	11-17-09	Acid reagent:	INR353

Calibration:

	0.10 mg/L	1.00 mg/L	Slope
Reference standard number	INSS673	INSS673	-49.3%

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%)
INSS673	0.50	0.471	94.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
091117.04	Synterra-eff	clear w/ part, NO color	S 0.0134	
↓	Duplicate		D 0.0140	UB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		<0.00841
091117.03	Synterra-inf	clear, NO color, PARTICLES	<0.00618
091117.01	Sweeny	clear, w/ part, NO color	<0.00471
091116.02	PAF-RWI-A	slightly cloudy w/ part, pale tan	<0.00403
091116.01	PAF-DSN-out-001-A	slightly cloudy, pale tan	0.0250
091117.02	Wilmington	clear, pale tan	<0.00164
091117.05	SQN-101-TOX A	clear w/ particles, pale tan	0.00200
091117.06	SQN-INF TOX	clear, NO color	<0.00152
		AB	UB

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%)
INSS673	0.50	0.477	95.4%

Reviewed by	JL
Date reviewed	11-17-09

ETS
Environmental Testing Solutions, Inc.

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

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

Analyst: UAB
Date analyzed: 11-19-09
Iodide reagent: INR357
Acid reagent: INR353

Calibration:

	0.10 mg/L	1.00 mg/L	Slope
Reference standard number	INSS673	INSS673	-49.8%

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%)
INSS673	0.50	0.510	102.0%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
091119.02	Sweeny	clear w/ particles, no color	S <0.00425	
	Duplicate		D <0.00331	UB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		<0.0097
091119.03	Wilmington WWTP	clear, pale tan	<0.000932
091119.01	Black River IN-storm	clear, tan	<0.000622
091118.05	PAF-DSN-001B	slightly cloudy, pale tan	0.0162
091118.03	SQN-101-TOX-B/A	clear, no color	<0.00533
091118.04	SQN-INT.TOX	slightly cloudy w/ particles pale tan	<0.00410
091118.06	PAF-RWI B	slightly cloudy w/ particles, pale tan	<0.00375
		UAB	
			UB

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%)
INSS673	0.50	0.502	100.4%

Reviewed by: [signature]
Date reviewed: 11-19-09

ETS
Environmental Testing Solutions, Inc.

Total Residual Chlorine
(Orion Electrode Method, Orion 97-70)

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

Analyst	LAB	Iodide reagent:	IN12357
Date analyzed	11-21-09	Acid reagent:	IN12353

Calibration:

	0.10 mg/L	1.00 mg/L	Slope
Reference standard number	INSS1673	INSS1673	-49.1%

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%)
INSS1673	0.50	0.500	100.0%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
091120.03	Swannanoa Base Flow	clear w/ particles, pale tan	S <0.00390	
↓	Duplicate		D <0.00305	LB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		<0.00888
091121.01	Sweeny	clear w/ particles, no color	0.00441
091121.02	Wilmington	clear, pale tan	<0.000841
091121.03	Little River-Instream	cloudy w/ particles, tan	<0.000445
091120.07	PAF-RWI-C	cloudy w/ particles, pale tan	0.00213
091120.06	PAF-DSN-001 C	clear, particles, pale tan	0.00888
091120.05	SQN-INT-TOX	clear, particles, pale tan	<0.00408
091120.04	SQN-101-TOX A	clear, no color	<0.00251
		LAB	LB

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%)
~~INS~~ INSS1673	0.50	0.492	98.4%

Reviewed by	JJ
Date reviewed	11-21-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst	KLL	Time initiated	0850
Date analyzed	11.15.09	Time completed	0941

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
4.8	IN2329	INS5704	0.0	12.0	12.0	0.0208	10.4

Blk correction 0.0-0.0=0.0ml

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%)
INSS734	100	100	12.0	21.5	9.5	10.4	99	99.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
11-12-09A	MHS H2O	100	21.5	27.4	5.9	10.4	S 61	
↓	Duplicate (B)	↓	27.4	33.3	5.9	↓	D 61	—

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)
INSS734	50	100	27.4	38.2	10.8	10.4	110

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%)
61	49	98.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
11-12-09B	MHS H2O	100	38.2	44.2	6.0	10.4	62
11-14-09	↓	↓	0.0	5.8	5.8	↓	60
11-09-09	Salt SW		37.7	48.0	10.3		110
	marshall floor		5.8	8.8	3.0		31
091112.03	A* CUTEC		9.3	9.5	0.2		2.1
091111.08	ERM - pilot	50	9.5	20.0	10.5	(2)	220
091110.02	Foxwood 1	100	20.0	22.7	2.7		28
091112.02	↓ 2	↓	22.7	25.3	2.6		27
091114.04	↓ 3	↓	25.4	28.2	2.8	↓	29

Reviewed by: [signature] Date reviewed: 11-15-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: KLV

Date analyzed: 11-15-09

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS734	100	100	28.2	37.7	9.5	10.4	99	99.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
	Swann Stream	100	0.0	1.7	1.7	10.4	S 18	
	Duplicate (B)	"	1.7	3.2	1.5	"	D 16	11.8%

not enough to dupl - 2mg/L difference

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)
INSS734	60	100	1.7	8.0	6.3	10.4	66

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%)
16	50	100.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
	Swann Br.dg	100	8.0	9.3	1.3	10.4	14
	Blk River Brdg		9.3	9.8	0.5		5.2
	Little River Bridge		10.0	11.6	1.6		17
	Blk River Stream		11.6	12.4	0.8		8.3
	Little River Stream		12.4	13.9	1.5		16
66580	VWIN T1		13.9	15.6	1.7		18
66581	T2		15.6	17.6	2.0		21
66582	T3		17.6	18.0	0.4		4.2
66583	T4		18.2	19.6	1.4		15

Reviewed by: JH

Date reviewed: 11-15-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: KEL

Date analyzed: 11.15.09

Titrate samples to pH = 4.50 S.U.

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS734	100	100	19.6	29.2	9.6	10.4	100	100.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
11.14.09	Salt SW	100	7.3			10.4	S	
↓	Duplicate (B)	↓				↓	D	

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)
INSS734	50	100				10.4	

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%)

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
66584	TH-15 VWin	100	29.2	29.9	0.7	10.4	7.3
66585	T6 ↓	↓	29.9	31.8	1.9		20
091107.11	Hercules 1	25	31.8	34.6	2.8	14	120
091110.01	2		34.6	37.5	2.9		120
091112.01	↓ 3	↓	37.6	40.4	2.8	↓	120

Reviewed by:

Date reviewed: 11.15.09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst	BSL
Date analyzed	11.22.09

Titrate samples to pH = 4.50 S.U.

Time initiated	1050
Time completed	1232

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
~~5.7~~ 5.7 BSL	INR329	INSS704	0.1	11.8	11.7	0.0214	10.7

BLK Correction: 0.0 → 0.1 = 0.1ml

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%)
INSS734	100	100	11.8	21.7	9.9	10.7	106	106%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
11-19-09	MHS H_2O	100	21.7	27.5	5.8	10.7	S 62	
↓	Duplicate (B)	↓	27.5	33.3	5.8	10.7	D 62	0%

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)
INSS734	50	100	27.5	~~30.5~~ 33.3	~~11.8~~ 10.8 BSL	10.7	120

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
62	58	116%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
11.21.09	MHS H_2O	100	38.3	44.0	5.7	10.7	61
11-19-09	SSW	↓	44.0	47.2	3.2	↓	34
11.17-09	MHS H_2O	↓	0.0	5.8	5.8	↓	62
11-14-09	Salt SW	↓	~~5.8~~ 0.0	~~11.7~~ 9.1	~~5.9~~ 9.1 BSL	↓	~~103~~ BSL 97
11-17-09	↓	↓	~~11.7~~ 9.1 BSL	19.3	10.2	↓	110
11-19-09	↓	↓	19.3	28.9	9.6	↓	100
11.21.09	↓	↓	28.9	39.3	10.4	↓	110
091116.01	TVA PAF001 1	50	39.3	44.3	5.0	(2)	110 = 107
091118.05	↓ 2	↓	44.3	49.5	5.2	↓	110 = 111

Reviewed by: [signature] Date reviewed: 11-22-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: BSC

Date analyzed: ~~11.22.BSC~~ 11.22.09

Titrate samples to pH = 4.50 S.U.

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)~~	~~pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500~~

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 724	100	100	0.0	9.5	9.5	10.7	100	100%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
091120.06	TVAPAF001 3	50	9.5	14.5	5.0	(2) 10.7	S 110=107	
↓	Duplicate (B)	↓	14.5	19.6	5.1	↓ ↓	D 110 =109	0%

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 734	~~50~~ 100 BSC	50	14.5	24.3	9.8	(2) 10.7	210

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%)
110	100	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml.	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
091116.02	TVA-PAF001int 1	50	24.3	29.9	5.6	(2) 10.7	120
091118.06	↓ 2	↓	29.9	35.8	5.9	↓	130 = 126
091120.07	↓ 3	↓	35.8	41.3	5.5		120 = 118
091118.07	TVAPAF002 AP	50	41.3	47.2	5.9	(2)	130 = 126
091118.08	↓ APint	↓	0.0	5.3	5.3	↓	110 = 113
091118.09	AA		5.3	11.0	5.7		120 = 122
091118.10	↓ AAint	↓	11.0	16.9	5.9	↓	130 = 126
091117.05	TVA-SAN 101 1	50	16.9	21.4	4.5	(2)	96
091118.03	↓ 2	↓	21.4	24.5	3.1	↓ —	66

Reviewed by: [signature]

Date reviewed: 11-22-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: BSC / KLW

Date analyzed: 11.22.09

Titrate samples to pH = 4.50 S.U.

Time initiated:

Time completed:

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 = 0.0180–0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS734	100	100	24.5	34.0	9.5	10.7	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%)
091120.04	TVASQN101 3	50	34.2	37.1	2.9	(2) 10.7	S 62	
↓	Duplicate (B)	↓	37.1	40.0	2.9	↓	D 62	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS734	100	50	37.1	44.7	7.6	(2) 10.7	160

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
62	98	98%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
091117.06	TVA-SQN int 1	50	0.0	3.1	3.1	(2) 10.7	66
091118.04	↓ 2	↓	3.1	6.1	3.0	↓	64
091120.05	↓ 3	↓	6.1	8.8	2.7	↓	50
091117.05	TVASQN101 UV 1	↓	8.8	12.0	3.2	↓	68
091118.03	↓ 2	↓	12.0	14.9	2.9	↓	62
091120.04	↓ 3	↓	14.9	17.6	2.7	↓	58
091117.06	TVASQN int UV 1	↓	17.7	20.8	3.1	↓	66
091118.04	↓ 2	↓	20.8	23.6	2.8	↓	60
091120.05	↓ 3	↓	23.6	26.6	3.0	↓	64

Reviewed by: [signature]

Date reviewed: 11.22.09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: [illegible]

Date analyzed: 11.23.09

Titrate samples to pH = 4.50 S.U.

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
JNSS 734	100	100	26.6	36.2	9.6	10.7	103	103.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
091117.01	Sweeny 1	25	36.2	36.5	0.3	(4) 10.7	S 13	
↓	Duplicate (B)	↓	36.5	36.8	0.3	↓	D 13	

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)
JNSS 734	200	25	36.5	41.6	5.1	(4) 10.7	220

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	207	103.5%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
091119.02	Sweeny 2	25	41.6	42.0	0.4	(4) 10.7	17
091121.01	↓ 3	↓	42.0	42.3	0.3	↓	13
091117.02	Wilmington 1	100	7.4	13.5	6.1		65
091119.03	↓ 2	↓	13.5	18.5	5.0		54
091121.02	↓ 3	↓	18.5	23.2	4.7		50
091117.01+02	Blend 1	50	23.2	25.5	2.3	(2)	49
091119.02+03	↓ 2	↓	25.6	28.0	2.4	↓	51
091121.01+02	↓ 3	↓	28.0	29.8	1.8	↓	38
	Little River 1	100	30.0	31.8	1.8	—	19

Reviewed by: [illegible]

Date reviewed: 11-22-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: BK 1502

Date analyzed: 11-22-09

Titrate samples to pH = 4.50 S.U.

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
JNS5734	100	100	31.0	41.1	9.3	10.7	100	100.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	1.0 Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
	Little River 2	100	29.6	31.4	~~0.5~~	10.7	S 19	
	Duplicate (B)	✓	31.4	33.3	1.9	↓	D 20	5.1%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
JNS5734	50	100	31.4	38.2	6.0	10.7	73

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%)
20	53	106.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
	Swan River 1	100	38.2	39.1	0.9	10.7	9.6
	↓ 2	↓	39.1	40.0	0.9	↓	9.6
	Bik River Stream	↓	40.0	40.5	0.5	↓	5.4

Reviewed by: JL

Date reviewed: 11-22-09

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: KLL

Date analyzed: ~~10~~ 11-20-09

Titrate samples to pH = 4.50 S.U.

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

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

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
							S	
	Duplicate (B)						D	

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)

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%)

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
11-12-09 A	MHS UU 1	100	40.5	46.2	5.7	10.7	61
11-12-09 B	2		21.6	27.4	5.8		62
11-17-09	3		27.4	33.1	5.7		61
11-19-09	4		33.1	38.8	5.7		61

Reviewed by: [illegible]

Date reviewed: 11-22-09

ETS
Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	[illegible]	Time initiated	0820
Date analyzed	11-15-09	Time completed	0848

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
INK332	INSS6526	0.0	10.0	10.0	0.020	20.0

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%)
INSS702	40	50	10.0	12.0	2.0	20.0	40	100.0%

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
11-12-09A	MHS H2O	50	12.0	16.5	4.5	20.0	S 90	
↓	Duplicate (B)	↓	16.5	21.0	4.5	↓	D 90	—

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)
INSS702	40	50	16.5	~~210~~ 230	6.5	20.0	130

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%)
90	40	100.0%

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	20.0	ND
11-12-09 B	MHS H2O	↓	23.0	27.5	4.5	↓	90
11-14-09	↓	↓	27.5	32.0	4.5	↓	90
166474	Marshall PPO	↓	32.0	36.9	4.9	↓	98
	Marshall	↓	36.9	41.9	5.0	↓	100
091112.03	Cytec	↓	41.9	42.2	0.3	↓	6.0
091111.08	Erm- pilot	10	0.0	3.9	3.9	(5)	390
091110.02	Foxwood 1	50	3.9	7.0	3.1	↓	62
091112.02	↓ 2	↓	7.0	8.3	1.3	↓	26
091114.04	↓ 3	↓	8.3	9.9	1.6	↓	32

If 0.2 N titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed 11-15-09

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	KLL	Time initiated	
Date analyzed	11.15.09	Time completed	

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

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%)
INSS702	40	50	9.9	11.9	2.0	20.0	40	100.0%

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
	Swann. Stream	50	12.0	12.5	0.5	20.0	S 10	
	Duplicate (B)	↓	12.5	13.0	0.5	↓	D 10	→

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)
INSS702	40	50	12.5	15.0	2.5	20.0	50

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%)
10	40	100.0%

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)						↓
	Swann. Bridge	50	15.0	15.9	0.9	20.0	18
	Blk River Bridge	↓	15.9	16.2	0.3	↓	6.0
	Little River Bridge		16.2	17.0	0.8		16
	Blk River Stream		17.0	18.3	1.3		26
	Little River Stream	↓	18.3	19.4	1.1	↓	22

Note: If > 1.5 ml of titrant is used, sample must be diluted. Reviewed by: [signature] Date reviewed 11-15-09

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst: BSL

Date analyzed: 11.22.09

Time initiated: 0913

Time completed: 1045

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
INR332	INSS656	0.5	10.3	9.8	~~0.0~~ 0.0204 BSL ~~0.2041~~ BSL	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 702	40	50	10.3	12.2	1.9	20.4	39	~~98%~~ 97.5%

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
11-19-09	MHS H2O	50	12.2	16.5	4.3	20.4	S 88	
↓	Duplicate (B)	↓	16.5	20.9	4.4	↓	D 90	2.2%

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 702	40	50	16.5	23.0	6.5	20.4	130

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%)
90	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	23.0	23.0	0.0	20.4	ND
11-21-09	MHS H2O		23.0	27.1	4.1		84
11-19-09	SSW		27.1	29.2	2.1		43
11-17-09	MHS H2O		29.2	33.6	4.4		90
11-12-09 A	MHS UV 1		33.6	38.0	4.4		90
11-12-09 B	2		38.0	42.3	4.3		88
11-17-09	3		42.3	46.7	4.4		90
11-19-09	4		0.0	4.2	4.2		86
091116.01	TVA-PAF 001 1	10	4.2	10.9	6.7	(5)	680 = 683
091118.05	2	↓	10.9	17.3	6.4	↓	650 = 653

Note: If 5 ml of titrant is used, sample must be diluted. Reviewed by: [illegible] Date reviewed: 11.22.09

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst: BSC

Date analyzed: 11-22-09

Time initiated:

Time completed:

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

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%)
INSS702	40	50	17.3	19.4	2.1	20.4	43	~~108%~~ 107.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
091120.06	TVAPAF 001 3	10	19.4	26.1	6.7	(5) 20.4	S 680 = 683	
	Duplicate (B)	↓	26.1	33.6 ~~32.2~~	6.5 ~~6.1~~	↓ ↓	D 660 ~~620~~ = 660	3.0% ~~9.2%~~ BSC

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)
INSS702	200	10	~~26.6~~ 26.1	34.6	8.5	(5) 20.4	870

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%)
~~620~~ BSC 660	210	105%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ~~ND~~	Blank ~~(should be = 0 mg $CaCO_3$/L)~~						
091116.02	TVA PAF 001 int 1	25	34.6	38.1	3.5	(2) 20.4	140 = 143
091118.06	↓ 2	↓	38.1	41.6	3.5	↓	140 = 143
091120.07	↓ 3	↓	41.6	45.0	3.4	↓	140 = 139
091118.07	TVA PAF 002 AP	10	0.0	2.2	2.2	(5)	220 = 224
091118.08	AP int	25	2.2	6.1	3.9	(2)	160 = 159
091118.09	AA	10	6.1	8.0	1.9	(5)	190 = 194
091118.10	↓ AA int	25	8.0	11.8	3.8	(2)	160 = 155
091117.05	TVA SQN 101 1	25	11.8	13.8	2.0	(2)	82
091118.03	↓ 2	↓	13.0	15.7	2.7	↓	110

Note: If 7.5 ml reagent is used, sample must be diluted.

Reviewed by: KDL

Date reviewed: 11-22-09

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	BSC
Date analyzed	11.22.09

Time initiated	
Time completed	

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

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%)
INS5702	40	50	15.7	17.5	1.8	20.4	~~38~~ 37	~~92.5%~~ 92.5%

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
091120.04	TVA-SQN 1013	25	17.5	19.2	1.7	(2) 20.4	S 69	
↓	Duplicate (B)	↓	~~19.2~~	~~20.7~~	~~1.5~~	~~↓ 1~~	D ~~61~~ BSC	6.0%
			20.7	22.3	1.6	(2) 20.4	65	

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)
INS5702	80	25	20.7	24.3	3.6	(2) 20.4	150

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%)
65	85	~~106.2%~~ 106.2%

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)						
091117.06	TVA SQN INT 1	25	24.3	26.3	2.0	(2) 20.4	82
091118.04	2	↓	26.3	28.0	1.7	↓	69
091120.05	3	↓	28.0	29.8	1.8	↓	73
091117.05	TVA SQN 1010U 1	25	29.8	31.7	1.9	(2)	78
091118.03	2	↓	31.7	33.6	1.9	↓	78
091120.04	3	↓	33.6	35.2	1.6	↓	65
091117.06	TVA SQN INT W 1	25	35.2	37.1	1.9	(2)	78
091118.04	2	↓	37.1	38.8	1.7	↓	69
091120.05	3	↓	38.8	40.5	1.7	↓	69

If 1.0 ml titrant is used, sample must be diluted. Reviewed by: KCR Date reviewed 11.22.09

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	RSC	Time initiated	
Date analyzed	11-22-09	Time completed	

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 = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

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%)
INSS702	40	50	40.5	42.3	1.8	20.4	37	~~93%~~ 92.5%

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
	Little River 1	50	42.3	43.9	1.6	20.4	S 33	
	Duplicate (B)	↓	43.9	45.4	1.5	↓	D 31	6.3%

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)
INSS702	40	50	43.9	47.1	3.2	20.4	65

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%)
31	34	85%

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)						
	Little River 2	50	10.0	11.8	1.8	20.4	37
	Swann River 1	↓	11.8	12.9	1.1	↓	22
	↓ 2	↓	12.9	13.9	1.0	↓	20
	Blk River Storm	↓	13.9	15.1	1.2	↓	24

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KH Date reviewed 11.22.09

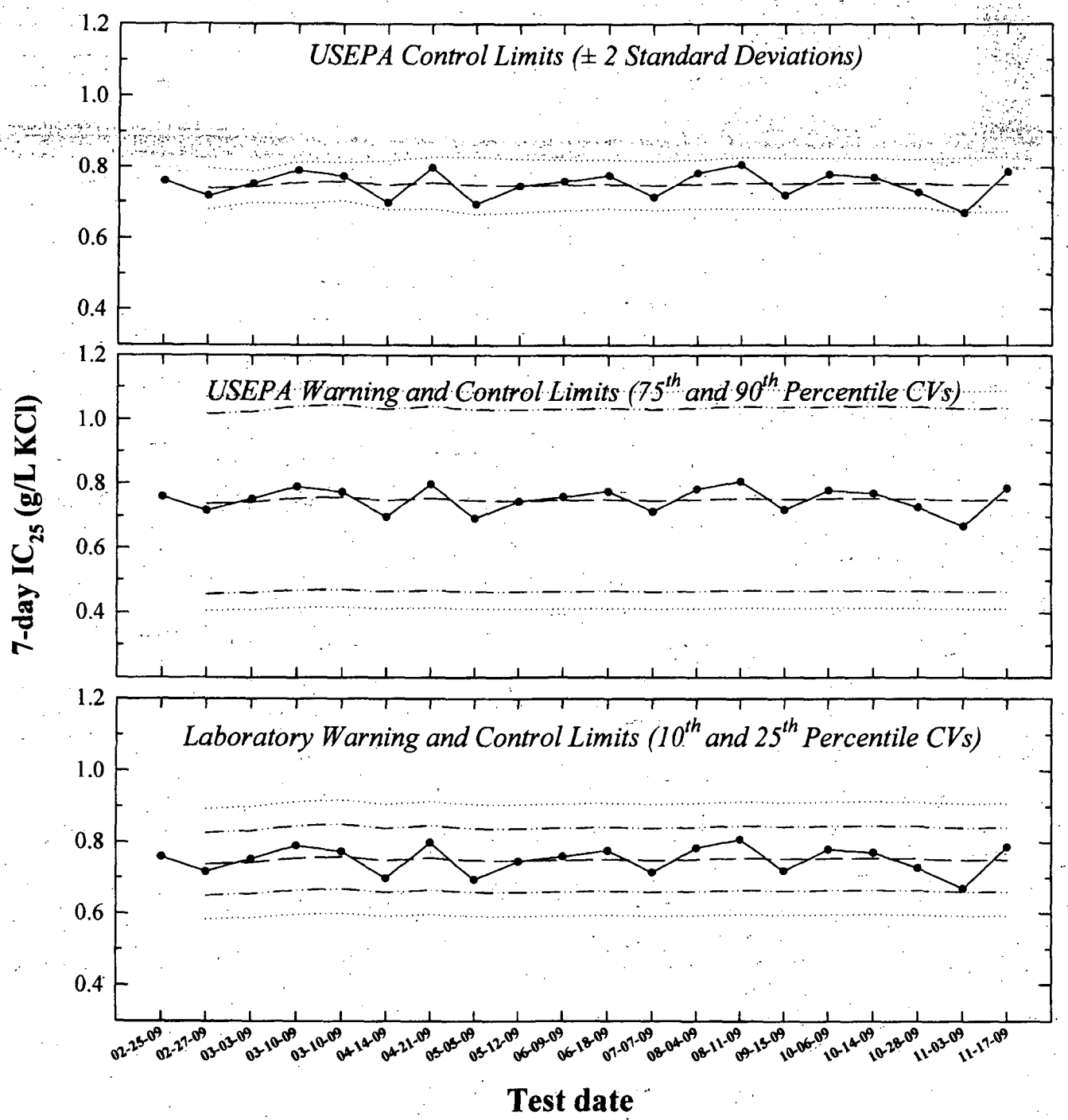
Sequoyah Nuclear Plant Biomonitoring
November 17 – 24, 2009

Appendix D

Reference Toxicant Test and
Control Chart

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas
Chronic Reference Toxicant Control Chart
Organism Source: Aquatox, Inc.



—•— **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 $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

····· **Control Limits** (mean $IC_{25} \pm S_{A.25}$, $S_{A.90}$, or 2 Standard Deviations)

ETS

Environmental Testing Solutions, Inc.

Pimephales promelas

Chronic Reference Toxicant Control Chart

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	02-25-09	0.76																	
2	02-27-09	0.72	0.74	0.03	0.68	0.80	0.09	0.65	0.83	0.15	0.58	0.89	0.28	0.46	1.02	0.33	0.41	1.07	0.04
3	03-03-09	0.75	0.74	0.02	0.70	0.79	0.09	0.65	0.83	0.16	0.59	0.90	0.28	0.46	1.02	0.33	0.41	1.08	0.03
4	03-10-09	0.79	0.75	0.03	0.69	0.81	0.09	0.66	0.85	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.04
5	03-10-09	0.77	0.76	0.03	0.70	0.81	0.09	0.67	0.85	0.16	0.60	0.92	0.29	0.47	1.05	0.34	0.42	1.10	0.04
6	04-14-09	0.70	0.75	0.03	0.68	0.82	0.09	0.66	0.84	0.16	0.59	0.91	0.28	0.46	1.03	0.34	0.41	1.09	0.05
7	04-21-09	0.80	0.76	0.04	0.68	0.83	0.09	0.66	0.85	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.42	1.10	0.05
8	05-05-09	0.69	0.75	0.04	0.67	0.83	0.09	0.66	0.84	0.16	0.59	0.90	0.28	0.46	1.03	0.34	0.41	1.08	0.05
9	05-12-09	0.75	0.75	0.04	0.67	0.82	0.09	0.66	0.84	0.16	0.59	0.90	0.28	0.46	1.03	0.34	0.41	1.08	0.05
10	06-09-09	0.76	0.75	0.04	0.68	0.82	0.09	0.66	0.84	0.16	0.59	0.91	0.28	0.46	1.03	0.34	0.41	1.09	0.05
11	06-18-09	0.78	0.75	0.04	0.68	0.82	0.09	0.66	0.84	0.16	0.59	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05
12	07-07-09	0.72	0.75	0.04	0.68	0.82	0.09	0.66	0.84	0.16	0.59	0.91	0.28	0.46	1.03	0.34	0.41	1.08	0.05
13	08-04-09	0.78	0.75	0.04	0.68	0.82	0.09	0.66	0.84	0.16	0.59	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05
14	08-11-09	0.81	0.75	0.04	0.68	0.83	0.09	0.66	0.85	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.42	1.09	0.05
15	09-15-09	0.72	0.75	0.04	0.68	0.83	0.09	0.66	0.84	0.16	0.59	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05
16	10-06-09	0.78	0.75	0.04	0.68	0.83	0.09	0.66	0.84	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05
17	10-14-09	0.77	0.76	0.04	0.68	0.83	0.09	0.66	0.85	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.42	1.10	0.05
18	10-28-09	0.73	0.75	0.03	0.68	0.82	0.09	0.66	0.84	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05
19	11-03-09	0.67	0.75	0.04	0.67	0.83	0.09	0.66	0.84	0.16	0.59	0.91	0.28	0.46	1.03	0.34	0.41	1.09	0.05
20	11-17-09	0.79	0.75	0.04	0.67	0.83	0.09	0.66	0.84	0.16	0.59	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05

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 Aquatox, Inc.

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Pimephales promelas
Chronic Reference Toxicant Data

Test number	Test date	Control Survival (%)	Control Mean Growth (mg/larvae)	CT for Control Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	02-25-09	100	0.659		8.2		0.07	11.1	
2	02-27-09	100	0.578	0.618	6.8	7.5	0.08	13.1	12.1
3	03-03-09	100	0.664	0.634	8.1	7.7	0.08	12.3	12.2
4	03-10-09	100	0.661	0.640	6.8	7.5	0.09	12.9	12.4
5	03-10-09	100	0.696	0.652	8.8	7.7	0.09	12.6	12.4
6	04-14-09	100	0.671	0.655	10.3	8.2	0.08	11.4	12.3
7	04-21-09	100	0.642	0.653	8.3	8.2	0.07	11.2	12.1
8	05-05-09	100	0.805	0.672	7.9	8.2	0.07	8.4	11.6
9	05-12-09	100	0.717	0.677	7.0	8.0	0.06	8.9	11.3
10	06-09-09	100	0.703	0.679	2.5	7.5	0.08	10.7	11.3
11	06-18-09	100	0.790	0.689	6.7	7.4	0.09	11.7	11.3
12	07-07-09	100	0.763	0.696	5.7	7.3	0.11	14.2	11.5
13	08-04-09	100	0.692	0.695	6.2	7.2	0.07	10.7	11.5
14	08-11-09	100	0.583	0.687	8.0	7.2	0.05	9.3	11.3
15	09-15-09	100	0.723	0.690	9.6	7.4	0.08	10.4	11.3
16	10-06-09	100	0.894	0.702	12.9	7.7	0.12	13.2	11.4
17	10-14-09	97.5	0.758	0.706	7.6	7.7	0.14	18.3	11.8
18	10-28-09	100	0.855	0.714	6.5	7.7	0.10	12.0	11.8
19	11-03-09	100	0.757	0.716	7.1	7.6	0.07	8.8	11.6
20	11-17-09	97.5	0.825	0.722	8.3	7.7	0.10	11.8	11.7

Note:

CV = Coefficient of variation for control growth.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

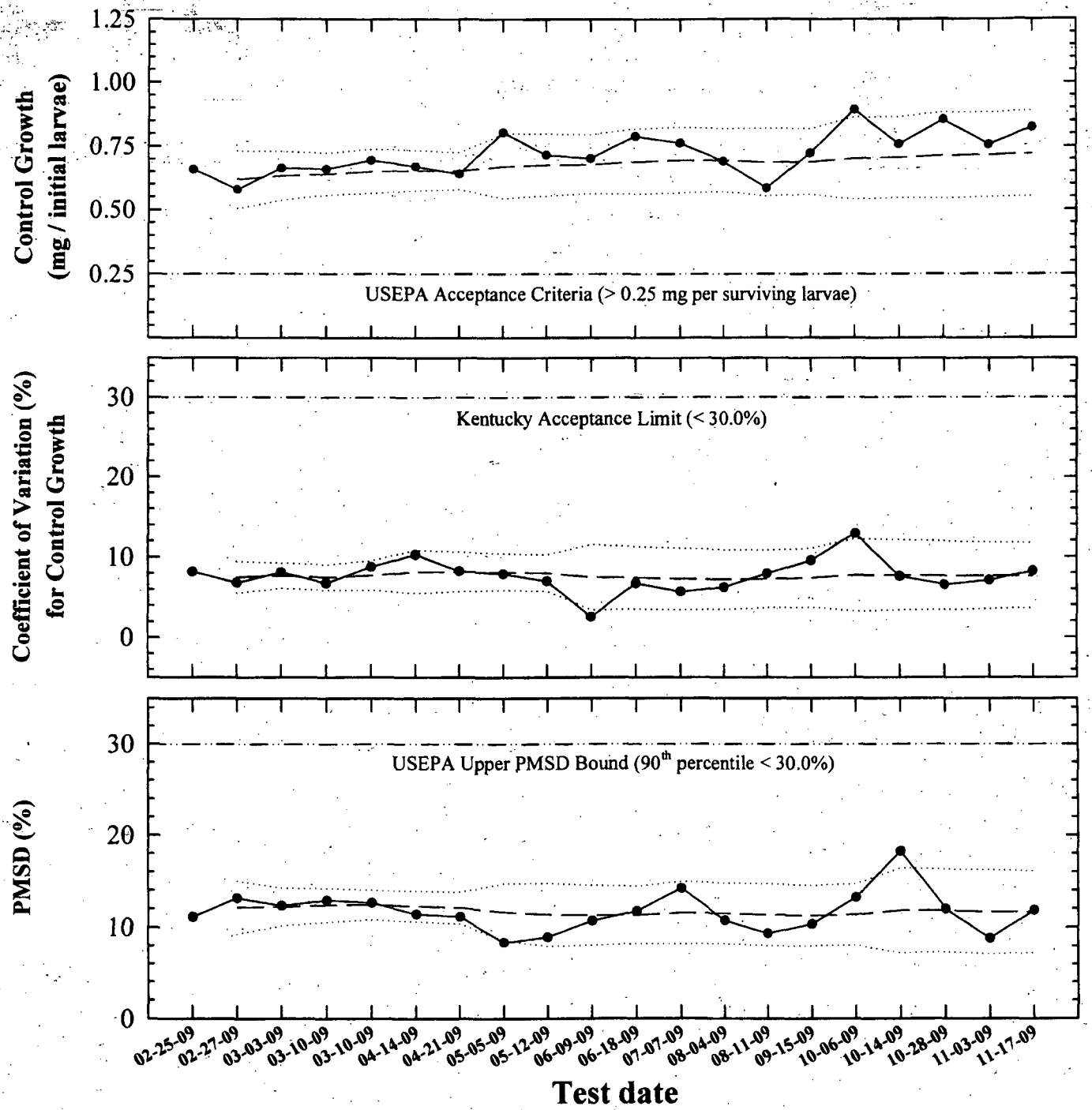
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

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

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.
USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2 Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas
Chronic Reference Toxicant Control Chart
Precision of Endpoint Measurements
Organism Source: Aquatox, Inc.



—•— **Control Reproduction, Coefficient of Variation (CV), or Percent Minimum Significant Difference (PMSD)** PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

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

····· **Control Limits** (mean Control Growth, CV, or PMSD ± 2 Standard Deviations)

ETS
Environmental Testing Solutions, Inc.

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

PpKClCR Test Number: 193

Dilution preparation information:						*Comments:*
KCl Stock INSS number:	INSS 742					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Milli-Q water.					
Dilution prep (mg/L)	450	600	750	900	1050	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	991	988	985	982	979	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		*Test information:*	
Organism age:	20.33 HOURS OLD	Randomizing template:	PURPLE
Date and times organisms were born between:	11-16-09 1600	Incubator number and shelf location:	3E
Organism source:	ATOX BATCH Pp 11-16-09	*Artemia* CHM number:	CHM 444
		Drying information for weight determination:	
Transfer vessel information:	pH = 7.46 S.U. Temperature = 24.6 °C	Date / Time in oven:	11-24-09 1140
		Initial oven temperature:	60°C
Average transfer volume:	0.2305 mL	Date / Time out of oven:	11-25-09 1140
		Final oven temperature:	60°C
		Total drying time:	24 HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding		Afternoon feeding		Test initiation, renewal, or termination		MHSW batch used
		Time	Analyst	Time	Analyst	Time	Analyst	
0	11-17-09	—	—	1600	JH	1220	JH	11-12-09 A
1	11-18-09	0800	JH	1400	JH	1234	JH	11-12-09 A
2	11-19-09	0800	JH	1400	JH	1220	JH	11-12-09 B
3	11-20-09	0800	JH	1400	JH	1225	JH	11-12-09 B
4	11-21-09	0800	JH	1400	JH	1210	JH	11-17-09
5	11-22-09	0800	JH	1400	JH	1215	JH	11-19-09
6	11-23-09	0800	JH	1400	JH	1220	JH	11-19-09
7	11-24-09					1121	JH	

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC_{50}	876.4
Average weight per initial larvae:	0.825		NOEC	600
Average weight per surviving larvae:	0.845	≥ 0.25 mg/larvae	LOEC	750
			ChV	670.8
			IC_{25}	787.3

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKCICR Test Number: 193

Survival and Growth Data

Day	Control				450 mg KCl/L				600 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	9 d	10	10	10	10	10	10	10	10
5	10	10	10	9	10	10	10	10	10	10	10	10
6	10	10	10	9	10	10	10	10	9 d	10	10	10
7	10 16	10	10	9	9 d	10	10	10	9	10	10 15	9 d
A = Pan weight (mg) Tray color code:: yellow Analyst: KLS Date: 10-28-09	13.90	15.09	13.58	13.21	14.99	13.74	12.68	12.51	14.11	14.50	14.06	14.34
B = Pan + Larvae weight (mg) Analyst: DLS Date: 12.01.09	22.97	23.14	22.01	20.65	22.02	21.33	21.22	20.67	21.90	22.98	21.21	22.23
C = Larvae weight (mg) = B – A	9.07	8.05	8.43	7.44	7.03	7.59	8.54	8.16	7.79	8.48	7.15	7.89
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.907	0.805	0.843	0.744	0.703	0.759	0.854	0.816	0.779	0.848	0.715	0.789
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.825				0.783		5.17%		0.783		5.17%	

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: H

Comments:

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKCICR Test Number: 193

Survival and Growth Data

Day	750 mg KCl/L				900 mg KCl/L				1050 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	10	7 3d	5 3d	6 4d	7 3d	4 6d	6 4d	6 4d	6 4d
2	10	10	9	10	7	5	6	7	4	5 1d	6	6
3	10	10	9	10	6 1d	5	5 1d	7	4	5	6	5 1d
4	9 1d	8 1d	9	9 1d	5 1d	5	5	6 1d	4	3 2d	5 1d	5
5	9	7 1d ~~8~~	9	~~8~~ 7 2d	4 1d	5	4 1d	4 2d	4	2 1d	4 1d	4 1d
6	8 1d	7	9	7	4	5	4	4	3 1d	1 1d	3 1d	3 1d
7	8	7 1fg	9 1fg	7	4 3fg	5	4	4	2 1d	1 fg	2 1d	2 1d
A = Pan weight (mg) Tray color code:: Yellow Analyst: KLS Date: 10-28-09	13.48	14.64	13.84	14.21	14.79	15.29	13.62	14.31	15.18	15.72	14.42	14.73
B = Pan + Larvae weight (mg) Analyst: DAS Date: 12-01-09	20.32	20.95	22.43	20.40	19.12	19.54	16.82	17.65	16.73	16.90	15.95	16.44
C = Larvae weight (mg) = B – A	6.84	6.31	8.59	6.19	4.33	4.25	3.20	3.34	1.55	1.18	1.53	1.71
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.684	0.631	0.859	0.619	0.433	0.425	0.320	0.334	0.155	0.118	0.153	0.171
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.698		15.37%		0.378		54.27%		0.149		81.97%	

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:

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas Chronic Reference Toxicant Test
EPA-821-R-02-013, Method 1000.0

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

Test number: PpKCICR #193
Test dates: November 17-24, 2009
Reveiwed by:

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / 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	13.90	22.97	9.07	0.907	0.845	5.2	0.907	97.5	0.825	8.3	Not applicable
	B	10	10	15.09	23.14	8.05	0.805			0.805				
	C	10	10	13.58	22.01	8.43	0.843			0.843				
	D	10	9	13.21	20.65	7.44	0.827			0.744				
450	E	10	9	14.99	22.02	7.03	0.781	0.803	5.2	0.703	97.5	0.783	8.4	5.1
	F	10	10	13.74	21.33	7.59	0.759			0.759				
	G	10	10	12.68	21.22	8.54	0.854			0.854				
	H	10	10	12.51	20.67	8.16	0.816			0.816				
600	I	10	9	14.11	21.90	7.79	0.865	0.826	9.1	0.779	95.0	0.783	7.0	5.1
	J	10	10	14.50	22.98	8.48	0.848			0.848				
	K	10	10	14.06	21.21	7.15	0.715			0.715				
	L	10	9	14.34	22.23	7.89	0.877			0.789				
750	M	10	8	13.48	20.32	6.84	0.855	0.899	4.6	0.684	77.5	0.698	15.9	15.3
	N	10	7	14.64	20.95	6.31	0.901			0.631				
	O	10	9	13.84	22.43	8.59	0.954			0.859				
	P	10	7	14.21	20.40	6.19	0.884			0.619				
900	Q	10	4	14.79	19.12	4.33	1.083	0.892	14.4	0.433	42.5	0.378	15.7	54.2
	R	10	5	15.29	19.54	4.25	0.850			0.425				
	S	10	4	13.62	16.82	3.20	0.800			0.320				
	T	10	4	14.31	17.65	3.34	0.835			0.334				
1050	U	10	2	15.18	16.73	1.55	0.775	0.894	21.8	0.155	17.5	0.149	15.0	81.9
	V	10	1	15.72	16.90	1.18	1.180			0.118				
	W	10	2	14.42	15.95	1.53	0.765			0.153				
	X	10	2	14.73	16.44	1.71	0.855			0.171				

Dunnett's MSD value: 0.0975 MSD = Minimum Significant Difference
PMSD: 11.8 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.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.
Upper PMSD bound determined by USEPA (90th percentile) = 30%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	11/17/2009	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	11/24/2009	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	1.0000	1.0000	0.9000
450	0.9000	1.0000	1.0000	1.0000
600	0.9000	1.0000	1.0000	0.9000
750	0.8000	0.7000	0.9000	0.7000
900	0.4000	0.5000	0.4000	0.4000
1050	0.2000	0.1000	0.2000	0.2000

			Transform: Arcsin Square Root						1-Tailed		Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Number
D-Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4				1	40
450	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	0.000	2.410	0.1471	1	40
600	0.9500	0.9744	1.3305	1.2490	1.4120	7.072	4	0.668	2.410	0.1471	2	40
*750	0.7750	0.7949	1.0846	0.9912	1.2490	11.294	4	4.696	2.410	0.1471	9	40
*900	0.4250	0.4359	0.7099	0.6847	0.7854	7.091	4	10.836	2.410	0.1471	23	40
*1050	0.1750	0.1795	0.4282	0.3218	0.4636	16.570	4	15.451	2.410	0.1471	33	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91163939	0.884	-0.1184496	-0.6290117
Bartlett's Test indicates equal variances (p = 0.82)	2.20082235	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	600	750	670.820393		0.07612662	0.07923945	0.63093674	0.00745088	7.3E-12	5, 18
Treatments vs D-Control										

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	11.90075	2.02798845	7.9258926	15.8756075	0.025	0.02529665	7.81472778	1	2.94271355	0.08402832	3
Intercept	-30.020498	5.96965262	-41.721018	-18.319979							
TSCR	0.02489373	0.0167698	-0.0079751	0.05776254							

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	558.771764	439.30398	632.540335
EC05	3.355	637.528005	533.944092	700.273975
EC10	3.718	683.954056	591.864566	740.053467
EC15	3.964	717.172783	633.972402	768.743169
EC20	4.158	744.720889	669.099597	792.886858
EC25	4.326	769.196521	700.275338	814.793373
EC40	4.747	834.497847	781.392728	877.222284
EC50	5.000	876.422566	829.69787	922.532758
EC60	5.253	920.453569	875.571987	976.186221
EC75	5.674	998.595923	946.148753	1085.24501
EC80	5.842	1031.4153	973.075482	1134.89329
EC85	6.036	1071.03413	1004.29166	1196.99431
EC90	6.282	1123.05276	1043.78666	1281.46378
EC95	6.645	1204.83569	1103.60002	1419.80285
EC99	7.326	1374.65171	1222.28693	1724.95223

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	11/17/2009	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	11/24/2009	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	0.9070	0.8050	0.8430	0.7440
450	0.7030	0.7590	0.8540	0.8160
600	0.7790	0.8480	0.7150	0.7890
750	0.6840	0.6310	0.8590	0.6190
900	0.4330	0.4250	0.3200	0.3340
1050	0.1550	0.1180	0.1530	0.1710

			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	0.8248	1.0000	0.8248	0.7440	0.9070	8.285	4				0.8248	1.0000
450	0.7830	0.9494	0.7830	0.7030	0.8540	8.441	4	0.933	2.180	0.0975	0.7830	0.9494
600	0.7828	0.9491	0.7828	0.7150	0.8480	6.959	4	0.939	2.180	0.0975	0.7828	0.9491
750	0.6983	0.8466	0.6983	0.6190	0.8590	15.872	4				0.6983	0.8466
900	0.3780	0.4583	0.3780	0.3200	0.4330	15.676	4				0.3780	0.4583
1050	0.1493	0.1810	0.1493	0.1180	0.1710	14.966	4				0.1493	0.1810

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93505901	0.805	-0.079593823	-1.15766298
Bartlett's Test indicates equal variances (p = 0.93)	0.14925823	9.2103405		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	600	>600			0.09751355	0.11823407	0.002338083	0.00400172	0.57733494	2, 9
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	444.48	171.45	43.33	936.54	-0.1280
IC10	671.85	93.51	216.91	825.11	-1.2941
IC15	745.05	48.64	537.03	808.42	-0.9607
IC20	768.01	29.70	646.35	819.59	-1.0239
IC25	787.32	20.62	712.96	835.30	-0.5410
IC40	845.27	13.72	797.28	882.88	-0.0132
IC50	883.90	13.24	846.50	930.45	0.3616

* indicates IC estimate less than the lowest concentration

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKClCR Test Number: 193

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KLL	KLL	KLL	LAB	LAB	KLL
Concentration	Parameter						
CONTROL	pH (S.U.)	7.48	7.38	7.63	7.18	7.50	7.41
	DO (mg/L)	7.8	7.4	7.6	7.2	7.7	7.5
	Conductivity (µmhos/cm)	385		332		328	
	Alkalinity (mg $CaCO_3$/L)	61				62	
	Hardness (mg $CaCO_3$/L)	90				90	
	Temperature (°C)	24.8	24.8	24.7	25.0	24.9	24.6
450 mg KCl/L	pH (S.U.)	7.61	7.49	7.71	7.35	7.58	7.46
	DO (mg/L)	7.9	7.4	7.6	7.3	7.8	7.4
	Conductivity (µmhos/cm)	1150		1110		1160	
	Temperature (°C)	24.8	24.7	24.8	25.1	24.9	24.6
600 mg KCl/L	pH (S.U.)	7.60	7.51	7.74	7.40	7.60	7.57
	DO (mg/L)	7.9	7.5	7.6	7.3	7.8	7.4
	Conductivity (µmhos/cm)	1390		1430		1440	
	Temperature (°C)	25.0	24.7	24.8	25.1	24.8	24.6
750 mg KCl/L	pH (S.U.)	7.65	7.54	7.94	7.40	7.63	7.57
	DO (mg/L)	7.9	7.4	7.6	7.3	7.9	7.5
	Conductivity (µmhos/cm)	1660		1690		1690	
	Temperature (°C)	24.7	24.9	24.8	25.1	24.8	24.5
900 mg KCl/L	pH (S.U.)	7.65	7.56	7.76	7.46	7.65	7.54
	DO (mg/L)	7.9	7.4	7.6	7.3	7.8	7.6
	Conductivity (µmhos/cm)	1920		1950		1960	
	Temperature (°C)	24.8	24.7	24.7	25.2	24.8	24.5
1050 mg KCl/L	pH (S.U.)	7.65	7.59	7.77	7.49	7.66	7.56
	DO (mg/L)	8.0	7.4	7.6	7.3	7.7	7.7
	Conductivity (µmhos/cm)	2190		2220		2230	
	Temperature (°C)	24.8	24.8	24.8	25.0	24.8	24.8
STOCK	Conductivity (µmhos/cm)	68100					
		Initial	Final	Initial	Final	Initial	Final

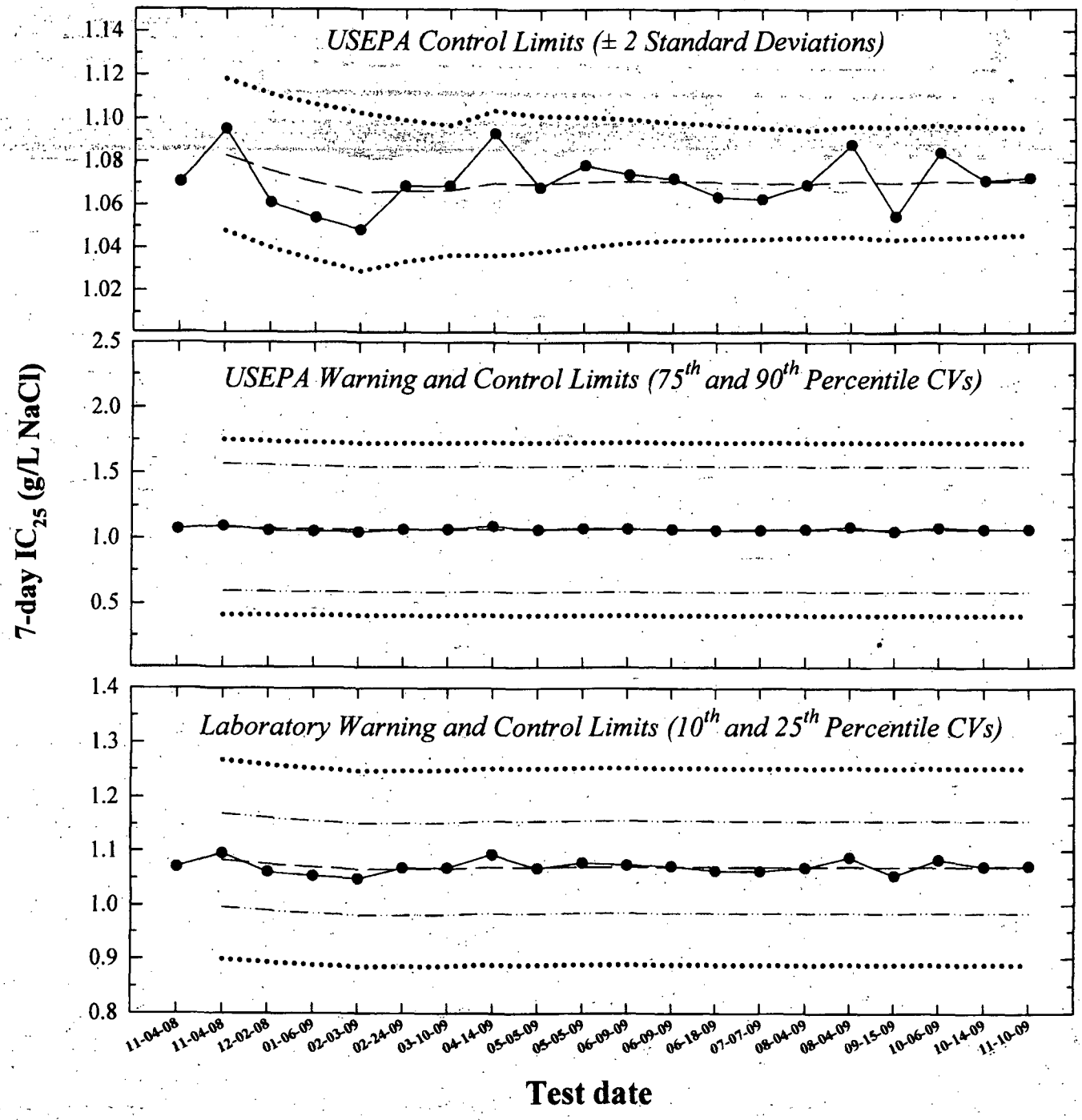
ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKClCR Test Number: 193

		Day							
		3		4 KBL		KBL 5		6	
	Analyst	KBL	LAB	LAB	BSC	BSC	KBL	KBL	KBL
Concentration	Parameter								
CONTROL	pH (S.U.)	7.71	7.40	7.55	6.92	7.42	7.16	7.79	6.98
	DO (mg/L)	7.8	7.5	7.9	7.4	7.8	6.7	8.0	6.4
	Conductivity (µmhos/cm)	332		336		334		334	
	Alkalinity (mg $CaCO_3$/L)			62		62			
	Hardness (mg $CaCO_3$/L)			90		88			
	Temperature (°C)	24.6	24.5	24.7	24.8	24.8	24.5	24.7	24.9
450 mg KCl/L	pH (S.U.)	7.80	7.59	7.68	7.13	7.56	7.20	7.79	7.10
	DO (mg/L)	7.9	7.6	8.0	7.5	7.9	6.5	7.9	6.3
	Conductivity (µmhos/cm)	1130		1140		1160		1140	
	Temperature (°C)	24.6	24.3	24.7	24.9	24.8	24.8	24.8	24.9
600 mg KCl/L	pH (S.U.)	7.81	7.60	7.72	7.17	7.59	7.27	7.79	7.17
	DO (mg/L)	7.9	7.4	8.0	7.6	8.0	6.6	7.9	6.2
	Conductivity (µmhos/cm)	1410		1420		1430		1410	
	Temperature (°C)	24.9	24.6	24.7	24.6	24.8	24.8	24.8	24.6
750 mg KCl/L	pH (S.U.)	7.82	7.58	7.74	7.16	7.62	7.26	7.79	7.17
	DO (mg/L)	7.9	7.4	8.0	7.6	8.0	6.8	8.0	6.3
	Conductivity (µmhos/cm)	1660		1660		1690		1640	
	Temperature (°C)	24.7	24.4	24.7	24.8	24.8	24.7	24.8	24.9
900 mg KCl/L	pH (S.U.)	7.85	7.61	7.76	7.21	7.63	7.32	7.80	7.16
	DO (mg/L)	7.9	7.4	7.9	7.5	8.0	6.8	8.0	6.2
	Conductivity (µmhos/cm)	1930		1970		1960		1970	
	Temperature (°C)	24.8	24.4	24.6	24.7	24.7	24.7	24.8	24.5
1050 mg KCl/L	pH (S.U.)	7.84	7.65	7.78	7.21	7.63	7.29	7.80	7.17
	DO (mg/L)	7.9	7.4	7.9	7.4	8.0	6.6	8.0	6.0
	Conductivity (µmhos/cm)	2160		2200		2240		2140	
	Temperature (°C)	24.8	24.4	24.6	24.7	24.7	24.6	24.8	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart



Test date

—●— **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 $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

····· **Control Limits** (mean $IC_{25} \pm S_{A.25}$, $S_{A.90}$, or 2 Standard Deviations)

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart

Test number	Test date	7-day IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	11-04-08	1.07																	
2	11-04-08	1.10	1.08	0.02	1.05	1.12	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.75	0.02
3	12-02-08	1.06	1.08	0.02	1.04	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.74	0.02
4	01-06-09	1.05	1.07	0.02	1.03	1.11	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.02
5	02-03-09	1.05	1.07	0.02	1.03	1.10	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.02
6	02-24-09	1.07	1.07	0.02	1.03	1.10	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.02
7	03-10-09	1.07	1.07	0.02	1.04	1.10	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
8	04-14-09	1.09	1.07	0.02	1.04	1.10	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.02
9	05-05-09	1.07	1.07	0.02	1.04	1.10	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
10	05-05-09	1.08	1.07	0.02	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
11	06-09-09	1.07	1.07	0.01	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	0.01
12	06-09-09	1.07	1.07	0.01	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	0.01
13	06-18-09	1.06	1.07	0.01	1.04	1.10	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
14	07-07-09	1.06	1.07	0.01	1.04	1.10	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
15	08-04-09	1.07	1.07	0.01	1.05	1.09	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
16	08-04-09	1.09	1.07	0.01	1.05	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	0.01
17	09-15-09	1.05	1.07	0.01	1.04	1.10	0.09	0.98	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
18	10-06-09	1.08	1.07	0.01	1.04	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
19	10-14-09	1.07	1.07	0.01	1.05	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
20	11-10-09	1.07	1.07	0.01	1.05	1.10	0.09	0.99	1.16	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.74	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.

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

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

USEPA Control and Warning Limits

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

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

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

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

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Ceriodaphnia dubia
Chronic Reference Toxicant Data

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	11-04-08	100	32.3		5.1		2.2	6.8	
2	11-04-08	100	31.5	31.9	6.2	5.6	2.4	7.7	7.2
3	12-02-08	100	31.5	31.8	4.6	5.3	2.5	8.0	7.5
4	01-06-09	100	33.2	32.1	4.0	4.9	2.0	6.1	7.1
5	02-03-09	100	31.4	32.0	6.6	5.3	1.9	6.0	6.9
6	02-24-09	100	32.2	32.0	6.0	5.4	1.8	5.7	6.7
7	03-10-09	100	31.9	32.0	5.8	5.5	2.6	8.2	6.9
8	04-14-09	100	33.9	32.2	6.7	5.6	2.0	5.8	6.8
9	05-05-09	100	33.6	32.4	4.3	5.5	2.3	6.8	6.8
10	05-05-09	100	34.6	32.6	7.7	5.7	2.2	6.5	6.8
11	06-09-09	100	31.3	32.5	6.4	5.8	2.1	6.7	6.7
12	06-09-09	100	31.1	32.4	9.4	6.1	2.6	8.3	6.9
13	06-18-09	100	32.3	32.4	7.3	6.2	1.9	5.8	6.8
14	07-07-09	100	29.9	32.2	3.3	6.0	2.2	7.2	6.8
15	08-04-09	100	30.4	32.1	4.7	5.9	2.2	7.3	6.9
16	08-04-09	100	32.0	32.1	5.1	5.8	2.2	6.9	6.9
17	09-15-09	100	31.6	32.0	5.4	5.8	2.2	7.0	6.9
18	10-06-09	100	31.4	32.0	4.3	5.7	2.4	7.6	6.9
19	10-14-09	100	33.3	32.1	3.5	5.6	2.6	7.7	7.0
20	11-10-09	100	34.0	32.2	6.2	5.6	2.6	7.7	7.0

Note:

CV = Coefficient of variation for control reproduction.
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.
Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.

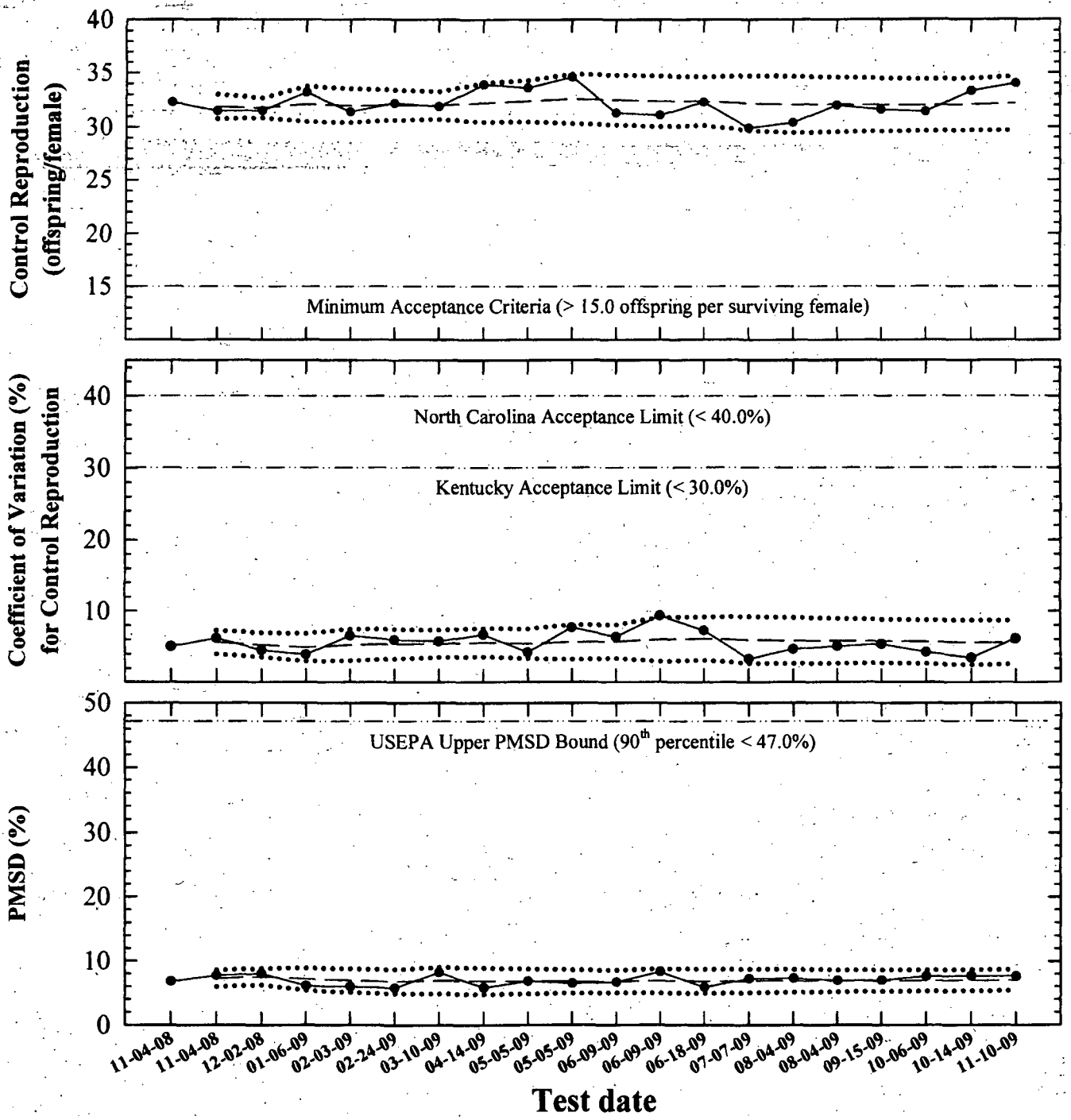
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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.

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart
Precision of Endpoint Measurements



—•— **Control Reproduction, Coefficient of Variation (CV), or Percent Minimum Significant Difference (PMSD)** PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

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

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

ETS Environmental Testing Solutions, Inc.

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

CdNaClCR #: 100

Dilution preparation information:						*Comments:*
NaCl Stock INSS number:		INSS 761				
Stock preparation:		100 g NaCl/L: Dissolve 50 g NaCl in 500 mL Milli-Q 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 source information:											*Test information:*	
Organism age:		< 24-hours old									Randomizing template color:	GOLD
Date and times organisms were born between:		11-10-09 0620 TO 1110									Incubator number and shelf location:	282
Culture board:	11-03-09 A											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	11-06-09
Culture board cup number:	7	8	9	11	13	20	25	26	27	29		
Transfer vessel information:	pH = 7.79 S.U. Temperature = 24.8 °C										*Selenastrum* batch:	11-01-09
Average transfer volume (mL):	0.0375 mL											

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Analyst
0	11-10-09	1115	11-03-09 A	[illegible]
1	11-11-09	1016	11-07-09 A	[illegible]
2	11-12-09	1025	11-07-09 A	[illegible]
3	11-13-09	1015	11-07-09 A	[illegible]
4	11-14-09	1015	11-07-09 A	[illegible]
5	11-15-09	1025	11-12-09 A	[illegible]
6	11-16-09	1030	11-12-09 A	[illegible]
7	11-17-09	1036		[illegible]

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC_{50}	>1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	34.0	≥ 15.0 offspring/female	ChV	894.4
% CV:	6.27%	< 40.0 %	IC_{25}	1072.6

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 100

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	5	5	4	5	5	5	6	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	10	13	14	12	12	13	12	14	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	18	16	18	15	19	17	17	14	16	15
Total young produced		36	31	36	33	36	34	35	32	36	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.0

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	6	5	5	5	5	4	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	13	12	13	14	11	13	13	13	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	15	19	16	17	17	17	18	14	17	13
Total young produced		33	38	33	35	36	33	35	32	35	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.0
% Reduction from Control:	0%

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 100

800 mg NaCl/L ***Survival and Reproduction Data***

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	4	5	5	5	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	13	12	10	12	14	12	12	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	17	17	17	19	16	14	14	18	14	14
Total young produced		34	34	34	36	31	31	33	35	31	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.0
% Reduction from Control:	2.9%

1000 mg NaCl/L ***Survival and Reproduction Data***

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

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.4
% Reduction from Control:	10.6%

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 100

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	4	3	5	5	3	3	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	5	5	0	8	10	0	9	7	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	5	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	8	5	9	0	7	7	10	4	9	6
Total young produced		20	14	17	10	20	20	13	17	20	18
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	16.9
% Reduction from Control:	50.3%

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

Note: Adult mortality (L = live, D = dead), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	7.9
% Reduction from Control:	76.8%

ETS
Environmental Testing Solutions, Inc.

Ceriodaphnia dubia Chronic Reference Toxicant Test
EPA-821-R-02-013, Method 1002.0

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

Test number: CdNaClCR #100
Test dates: November 10-17, 2009
Reveiwed by:

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	36	31	36	33	36	34	35	32	36	31	100	34.0	6.2	Not applicable
600	33	38	33	35	36	33	35	32	35	30	100	34.0	6.6	0.0
800	34	34	34	36	31	31	33	35	31	31	100	33.0	5.7	2.9
1000	29	33	30	29	30	31	31	29	28	34	100	30.4	6.2	10.6
1200	20	14	17	10	20	20	13	17	20	18	100	16.9	20.8	50.3
1400	9	7	9	2	7	12	10	5	6	12	100	7.9	39.8	76.8

Dunnett's MSD value: 2.604
PMSD: 7.7

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.

Lower PMSD bound determined by USEPA (10th percentile) = 13%.

Upper PMSD bound determined by USEPA (90th percentile) = 47%.

Lower and upper PMSD bounds were determined from the 10th and 90th percentile, respectively, of PMSD data from EPA's WET Interlaboratory Variability Study (USEPA, 2001a; USEPA, 2001b).

USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2-Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	11/10/2009	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	11/17/2009	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	36.000	31.000	36.000	33.000	36.000	34.000	35.000	32.000	36.000	31.000
600	33.000	38.000	33.000	35.000	36.000	33.000	35.000	32.000	35.000	30.000
800	34.000	34.000	34.000	36.000	31.000	31.000	33.000	35.000	31.000	31.000
1000	29.000	33.000	30.000	29.000	30.000	31.000	31.000	29.000	28.000	34.000
1200	20.000	14.000	17.000	10.000	20.000	20.000	13.000	17.000	20.000	18.000
1400	9.000	7.000	9.000	2.000	7.000	12.000	10.000	5.000	6.000	12.000

			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	34.000	1.0000	34.000	31.000	36.000	6.201	10				34.000	1.0000
600	34.000	1.0000	34.000	30.000	38.000	6.649	10	0.000	2.287	2.604	34.000	1.0000
800	33.000	0.9706	33.000	31.000	36.000	5.714	10	0.878	2.287	2.604	33.000	0.9706
*1000	30.400	0.8941	30.400	28.000	34.000	6.241	10	3.161	2.287	2.604	30.400	0.8941
*1200	16.900	0.4971	16.900	10.000	20.000	20.771	10	15.015	2.287	2.604	16.900	0.4971
*1400	7.900	0.2324	7.900	2.000	12.000	39.783	10	22.917	2.287	2.604	7.900	0.2324

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.85725808	1.035	-0.4383847	0.05843284
Bartlett's Test indicates equal variances (p = 0.27)	6.40927744	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		2.60422823	0.07659495	1213.54667	6.48518519	8.2E-33	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	853.846154	68.891583	658.291667	950.259615	-0.9158
IC10	984.615385	37.1605902	889.984375	1018.01841	-0.4734
IC15	1022.22222	10.1708642	1001.41628	1040.13001	0.1120
IC20	1047.40741	9.4426387	1027.71794	1065.06914	0.2104
IC25	1072.59259	9.34744229	1054.19332	1087.34371	0.2270
IC40	1148.14815	11.8528783	1126.04654	1168.22075	0.4312
IC50	1198.51852	16.0574224	1169.42431	1229.62477	0.4948

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 100

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KLK	KLK	KLK	KLK	KLK	KLK
Concentration	**Parameter**						
CONTROL	**pH** (S.U.)	7.78	7.55	7.53	7.74	7.68	7.70
	DO (mg/L)	7.6	7.9	7.8	7.7	7.6	7.8
	Conductivity (µmhos/cm)	346		326		330	
	Alkalinity (mg $CaCO_3$/L)	62					
	Hardness (mg $CaCO_3$/L)	90					
	Temperature (°C)	24.7	25.0	24.8	24.9	24.8	24.7
600 mg NaCl/L	**pH** (S.U.)	7.78	7.63	7.67	7.81	7.76	7.75
	DO (mg/L)	7.4	7.9	7.7	7.6	7.6	7.7
	Conductivity (µmhos/cm)	1510		1500		1490	
	Temperature (°C)	24.9	24.9	24.8	24.9	24.6	24.5
800 mg NaCl/L	**pH** (S.U.)	7.77	7.64	7.68	7.81	7.77	7.76
	DO (mg/L)	7.4	7.8	7.7	7.6	7.6	7.7
	Conductivity (µmhos/cm)	1850		1870		1890	
	Temperature (°C)	24.9	24.9	24.8	24.9	24.6	24.8
1000 mg NaCl/L	**pH** (S.U.)	7.75	7.65	7.69	7.81	7.84	7.76
	DO (mg/L)	7.5	7.8	7.7	7.6	7.7	7.7
	Conductivity (µmhos/cm)	2160		2200		2240	
	Temperature (°C)	24.8	24.9	24.7	24.9	24.8	24.8
1200 mg NaCl/L	**pH** (S.U.)	7.75	7.65	7.70	7.84	7.84	7.78
	DO (mg/L)	7.5	7.8	7.8	7.6	7.7	7.7
	Conductivity (µmhos/cm)	2630		2640		2680	
	Temperature (°C)	24.8	25.1	24.7	25.0	24.7	24.6
1400 mg NaCl/L	**pH** (S.U.)	7.74	7.65	7.73	7.83	7.84	7.77
	DO (mg/L)	7.5	7.8	7.8	7.6	7.7	7.7
	Conductivity (µmhos/cm)	2920		2980		3040	
	Temperature (°C)	24.8	24.9	24.7	25.0	24.7	24.8
STOCK	**Conductivity** (µmhos/cm)						
		Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 100

		Day							
		3		4		5		6	
	Analyst	KLN	LAB	LAB	KLN	KLN	KLN	KLN	KLN
Concentration	Parameter								
CONTROL	pH (S.U.)	7.78	7.58	7.43	7.72	7.76	7.61	7.76	7.54
	DO (mg/L)	7.6	7.8	7.5	7.6	7.5	8.1	8.0	8.0
	Conductivity (µmhos/cm)	333		345		343		325	
	Alkalinity (mg $CaCO_3$/L)					61			
	Hardness (mg $CaCO_3$/L)					90			
	Temperature (°C)	24.7	25.0	24.8	24.7	24.9	25.1	25.2	25.0
600 mg NaCl/L	pH (S.U.)	7.81	7.69	7.68	7.77	7.77	7.69	7.76	7.62
	DO (mg/L)	7.7	7.7	7.6	7.6	7.5	8.1	8.1	8.1
	Conductivity (µmhos/cm)	1510		1530		1490		1480	
	Temperature (°C)	24.7	24.8	25.0	25.1	25.0	25.1	25.0	25.0
800 mg NaCl/L	pH (S.U.)	7.86	7.74	7.72	7.78	7.77	7.69	7.81	7.62
	DO (mg/L)	7.7	7.7	7.7	7.6	7.5	8.1	8.1	8.1
	Conductivity (µmhos/cm)	1960		1890		1860		1930	
	Temperature (°C)	24.7	24.8	25.0	24.8	25.0	25.0	25.0	24.7
1000 mg NaCl/L	pH (S.U.)	7.87	7.76	7.74	7.81	7.78	7.69	7.80	7.66
	DO (mg/L)	7.8	7.7	7.7	7.6	7.5	8.2	8.1	8.2
	Conductivity (µmhos/cm)	2320		2300		2250		2330	
	Temperature (°C)	24.7	25.0	25.0	24.8	24.8	25.0	25.0	24.6
1200 mg NaCl/L	pH (S.U.)	7.86	7.77	7.76	7.80	7.79	7.73	7.80	7.67
	DO (mg/L)	7.8	7.6	7.6	7.6	7.5	8.2	8.2	8.2
	Conductivity (µmhos/cm)	2770		2750		2690		2760	
	Temperature (°C)	24.7	24.9	24.9	24.9	25.0	24.9	24.9	25.0
1400 mg NaCl/L	pH (S.U.)	7.89	7.79	7.78	7.80	7.81	7.73	7.80	7.66
	DO (mg/L)	7.8	7.6	7.7	7.7	7.6	8.2	8.2	8.2
	Conductivity (µmhos/cm)	3140		3120		3050		3140	
	Temperature (°C)	24.7	24.9	24.9	24.9	25.1	24.9	25.0	24.8
		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-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE [ ] ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	8.2	12	0	13 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	56	81	26	********	6	8	19	0	5 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<56	<60	26	********	<6	<6	19	0	5 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.196	1.446	03	********	********	********	**	0	31 / 31	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		SEE PERMIT	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah 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 Howard Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

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

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	8.0	********	8.7	12	0	7 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********	2	19	0	7 / 31	COMPOS
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********	<6	19	0	7 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		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
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********	0.023	19	0	7 / 31	COMPOS
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********	0.14	19	0	7 / 31	COMPOS
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	0.021	0.034	03	********	********	********	**	0	7 / 31	CALCTD
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

The Metal Ponds (Outfall 107) were discharged directly to the LVWTP (Outfall 103) on 12/3/09, 12/8/09, 12/10/09, 12/15/09, 12/16/09, 12/17/09, and 12/22/09. No phosphorous bearing cleaning solutions were used.

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

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX.	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	04	********	********		04			
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	DEG C	********	********	38.3 DAILY MX	DEG C		DAILY	GRAB-4
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	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	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	********	********	********	****		DAILY	CALCTD
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	********		19			
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.10 DAILY MX	MG/L		WEEKLY	GRAB-4
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

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-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio HAMILTON COUNTY

ATTN: Stephanie A. Howard

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

TN0026450	110 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	09	12	01	To	09	12	31

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	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		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

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-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

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-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

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-SQN)
SODDY - DAISY, TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Locatio 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	09	12	01	To	09	12	31

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

Form Approved.
OMB No. 2040-0004

*** NO DISCHARGE XX ***

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		
Christopher R. Church Sequoyah 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 Environmental Manager SQN & WBN	423	843-7001	10	01	07
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 her*

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