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

May 14, 2008

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 APRIL 2008

Enclosed is the April 2008 Discharge Monitoring Report for Sequoyah Nuclear Plant. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Stephanie A. Howard

Stephanie A. Howard
Principal Environmental Engineer
Signatory Authority for
Timothy P. Cleary
Site Vice President
Sequoyah Nuclear Plant

Enclosure
cc (Enclosure):

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

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

IE25
NRR

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	08	04	01	To	08	04	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	21.3	04	0	30 / 30	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	30.9	04	0	30 / 30	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	********	********	**	********	********	2.7	04	0	30 / 30	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0 DAILY MX	DEG. C.		CONTINUOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	7.6	********	8.2	12	0	5 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	18	31	19	0	2 / 30	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 / 30	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	********	1674	03	********	********	********	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTINUOUS	RCORDR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A Howard Principal Environmental Engineer	423	843-6700	08	05	13
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following 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**
04/09/2008 @ 1101	0.31 mg/l	04/12/2008 @ 0735	CLS	TN EPA 8015
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
04/09/2008 @ 1210	<0.10 mg/l	04/12/2008 @ 0723	CLS	TN EPA 8015

Sample Date	Mean # of ZM/m^3	% Settlers	Water Temp. (°C)	Sample Date	Mean# of Asiatic Clams/m^3	Water Temp. (°C)	LOCATION	SUB LOCATION	NOTES: % Gravid Asiatic Clam	COLLECTED BY
11/16/2007	0	0	15	11/16/2007	44	15	Inplant	RCW		Dickie Adcock
11/18/2007	0	0	15	11/18/2007	60	15	Inplant	RCW		Dickie Adcock
11/19/2007	0	0	14	11/19/2007	29	15	Inplant	RCW		Dickie Adcock
11/20/2007	15	0	15	11/20/2007	45	15	Inplant	RCW		Dickie Adcock
11/27/2007	0	0	14	11/27/2007	15	14	Inplant	RCW		Dickie Adcock
12/6/2007	0	0	12	12/06/2007	14	12	Inplant	RCW		Dickie Adcock
12/10/2007	0	0	12	12/06/2007	0	12	Inplant	RCW		Dickie Adcock
12/21/2007	0	0	10	12/21/2007	0	10	Inplant	RCW		Dickie Adcock
12/28/2007	0	0	9	12/28/2007	0	9	Inplant	RCW		Dickie Adcock
01/03/2008	0	0	8	01/03/2008	0	8	Inplant	RCW		Dickie Adcock
01/11/2008	0	0	9	01/11/2008	0	9	Inplant	RCW		Dickie Adcock
01/18/2008	0	0	8	01/18/2008	0	8	Inplant	RCW		Dickie Adcock
01/25/2008	0	0	6	01/25/2008	0	6	Inplant	RCW		Dickie Adcock
02/01/2008	0	0	7	02/01/2008	0	7	Inplant	RCW		Dickie Adcock
02/08/2008	0	0	9	02/08/2008	0	9	Inplant	RCW		Dickie Adcock
02/15/2008	0	0	8	02/15/2008	0	8	Inplant	RCW		Dickie Adcock
02/22/2008	0	0	8	02/22/2008	0	8	Inplant	RCW		Dickie Adcock
02/29/2008	0	0	8	02/29/2008	0	8	Inplant	RCW		Dickie Adcock
03/07/2008	0	0	10	03/07/2008	0	10	Inplant	RCW		Dickie Adcock
03/14/2008	0	0	10	03/14/2008	0	10	Inplant	RCW		Dickie Adcock
03/21/2008	30	0	12	03/21/2008	0	12	Inplant	RCW		B. Love / Dick Adcock
03/28/2008	30	0	12	03/28/2008	75	12	Inplant	RCW		Dickie Adcock
04/04/2008	29	0	13	04/04/2008	119	13	Inplant	RCW		Dickie Adcock
04/11/2008	72	0	16	04/11/2008	302	16	Inplant	RCW		Dickie Adcock
04/18/2008	30	0	15	04/18/2008	104	15	Inplant	RCW		Dickie Adcock
04/25/2008	29	0	15	04/25/2008	72	15	Inplant	RCW		Dickie Adcock
05/02/2008	14	0	17	05/02/2008	58	17	Inplant	RCW		Dickie Adcock

ERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
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acility TVA - SEQUOYAH NUCLEAR PLANT
ocation HAMILTON COUNTY

TTN: 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	08	04	01	To	08	04	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
HLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.010	0.030	19	0	29 / 30	GRAB
0060 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.10 MO AVG	0.10 INST MAX	MG/L		WEEK-DAYS	CALCTD
EMPERATURE - C, RATE OF HANGE	SAMPLE MEASUREMENT	********	0	62	********	********		**	0	30 / 30	CALCTD
2234 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	2 DAILY MX	DEG C/HR	********	********	*******	****		CONTINUOUS	CALCTD
	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		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false *information, including the possibility of fine and imprisonment for knowing violations.*	Stephanie A Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	05	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

The following injections occured: 1. Biodetergent 73551 (max. calc. conc. was 0.018mg/L--limit 2.0mg/L) 2. H-150M (max. calc. conc. was 0.040mg/L--limit 0.050mg/L) 3. H-150M (low detection level analytical method was <0.020mg/L--limit 0.050mg/L)

:RMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
ame TVA - SEQUOYAH NUCLEAR PLANT
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SODDY - DAISY TN 37384
cility TVA - SEQUOYAH NUCLEAR PLANT
cation HAMILTON COUNTY

TTN: Stephanie A. Howard

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

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	04	01	To	08	04	30

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
225 STATRE 7DAY CHR ERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
RP3B 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
225 STATRE 7DAY CHR IMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
RP6C 1 0 0 FFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	PERMIT REQUIREMENT										

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Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	05	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled April 13-18, 2008. Report is attached.

May 12, 2008

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, APRIL, 2008

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101, samples collected April 13-18, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of daphnids to intake samples resulted in no significant differences from controls during this study period, but fathead minnow survival was significantly reduced when exposed to intake samples.

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. Although dose response and survival in these tests were not affected enough to jeopardize test acceptability or compliance with permit limits, fish survival was improved by UV treatment of intake and effluent samples prior to exposures. These results suggest that fish pathogen interference was a likely cause of mortality observed in untreated effluent and intake samples.

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 2L-M

CLR:RMS
Attachment
cc (Attachment):
Sherrard, R. M., PSC 1X-C
Files, ER&TA, CEB 1B-M

SQN April 2008m

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: May 12, 2008

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: April 13-18, 2008
10. Average Flow on Days Sampled (MGD): 1549, 1569, 1561, 1560, 1568, 1565
11. Pertinent Site Conditions: Towerbrom 960 (chlorination) was injected from April 13-18, 2008. The dates and times for the Towerbrom 960 injection are in the following table.

Injection Location	Date/Start Time (ET)	Date/Ending Time (ET)
Raw Cooling Water (RCW)	4/13/08 0000	4/18/08 2359
Essential Raw Cooling Water (ERCW) Train A & B	4/14/08 1925 4/15/08 1455	4/15/08 1245 4/18/08 2359

12. Test Dates: April 15-22, 2008
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: Stephanie Howard Phone #: (423) 843-6713

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 April 13-18, 2008, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were >100 percent. Exposure of daphnids to intake samples resulted in no significant difference from the control during this study period, but fathead minnow survival was significantly reduced when exposed to intake samples.

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. Although dose response and survival in these tests were not affected enough to jeopardize test acceptability or compliance with permit limits, fish survival was improved by UV treatment of intake and effluent samples prior to exposures. These results suggest that fish pathogen interference was a likely cause of mortality observed in untreated effluent and intake samples.

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (ET) Collected	Date (MM/DD/YY)/ Time (ET) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (ET) Last Used By
101	04/13/08 0808 to 04/14/08 0708	04/14/08 1428	0.9/1.2†	<0.10	04/15/08 1137 04/16/08 1120
Intake	04/13/08 0922 to 04/14/08 0822	04/14/08 1428	1.1	<0.10	04/15/08 1137 04/16/08 1120
101	04/15/08 0732 to 04/16/08 0632	04/16/08 1413	1.1/1.6†	<0.10	04/17/08 1215 04/18/08 1203
Intake	04/15/08 0752 to 04/16/08 0652	04/16/08 1413	2.1	<0.10	04/17/08 1215 04/18/08 1203
101	04/17/08 0725 to 04/18/08 0625	04/18/08 1332	2.0/1.4†	<0.10	04/19/08 1210 04/20/08 1207 04/21/08 1213
Intake	04/17/08 0740 to 04/18/08 0640	04/18/08 1332	1.1	<0.10	04/19/08 1210 04/20/08 1207 04/21/08 1213

*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:	19.25 – 19.75 hours old	<24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	04/15/08 1115 ET	04/15/08 1100 ET
UV Treated Outfall 101	04/15/08 1137 ET	
7. Test Termination: (Date/Time)		
Outfall 101	04/22/08 1138 ET	04/22/08 1003 ET
UV Treated Outfall 101	04/22/08 1153 ET	
8. Test Temperature: Outfall 101:	Mean = 24.7°C (24.2 - 25.2°C)	Mean = 24.9°C (24.6 - 25.2°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.7°C (24.2 - 25.2°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 April 15-22, 2008 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	93	93	93	93	88
72.6%	100	100	98	98	98	95	93
100.0%	100	100	100	98	95	95	93
Intake	100	100	93	83	60	48	48

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.846	0.810	0.748	0.835	0.810
11.3%	0.802	0.825	0.813	0.798	0.810
22.6%	0.838	0.712	0.793	0.863	0.802
45.2%	0.872	0.722	0.728	0.591	0.728
72.6%	0.791	0.742	0.621	0.773	0.732
100.0%	0.787	0.617	0.873	0.825	0.776
Intake	0.439	0.530	0.525	0.236	0.433

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 April 15-22, 2008 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/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	35	33	32	34	32	34	33	28	32	32	32.5
11.3%	36	37	39	36	40	34	36	37	33	37	36.5
22.6%	38	39	36	40	36	38	40	38	41	41	38.7
45.2%	41	35	38	42	39	37	38	40	39	41	39.0
72.6%	39	38	42	38	41	39	38	41	42	38	39.6
100.0%	43	38	40	42	41	39	41	39	44	38	40.5

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 April 15-22, 2008 using water from Intake

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

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	33	33	33	37	31	35	33	32	33	33	33.3
Intake	41	40	39	41	39	39	42	37	36	39	39.3

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 April 15-22, 2008 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	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
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.866	0.672	0.838	0.847	0.806
11.3%	0.792	0.867	0.743	0.787	0.797
22.6%	0.841	0.682	0.840	0.808	0.793
45.2%	0.912	0.833	0.709	0.867	0.830
72.6%	0.785	0.809	0.812	0.888	0.824
100.0%	0.767	0.810	0.804	0.776	0.789
Intake	0.871	0.770	0.878	0.869	0.847

IC_{25} Value: $\geq$ 100% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: $\leq$ 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	April 15-22, 2008	1202	7-days	KCl	0.59 g/L
Ceriodaphnia dubia	April 8-15, 2008	1507	7-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 Effluent (SQN), Outfall 101, April 15-22, 2008.

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	24.7 24.6 - 24.9	24.6 24.4 - 24.8	7.7 7.5 - 8.0	7.5 6.4 - 7.9	7.78 7.49 - 7.97	7.43 7.18 - 7.54	319 303 - 343	61 59 - 63	92 90 - 94	- - -
	11.3%	24.8 24.7 - 25.0	24.5 24.2 - 24.7	7.8 7.5 - 8.0	7.4 6.6 - 7.9	7.66 7.58 - 7.84	7.50 7.30 - 7.70	305 290 - 312	- - -	- - -	- - -
	22.6%	24.9 24.7 - 25.0	24.4 24.2 - 24.7	7.8 7.6 - 8.0	7.4 6.4 - 7.9	7.62 7.55 - 7.71	7.41 7.14 - 7.54	290 278 - 298	- - -	- - -	- - -
	45.2%	24.9 24.7 - 25.0	24.5 24.2 - 24.6	7.8 7.5 - 7.9	7.4 6.2 - 7.8	7.60 7.54 - 7.70	7.38 7.03 - 7.52	256 243 - 266	- - -	- - -	- - -
	72.6%	24.9 24.8 - 25.1	24.5 24.3 - 24.7	7.8 7.5 - 8.0	7.3 5.9 - 7.8	7.56 7.50 - 7.64	7.32 7.01 - 7.48	212 207 - 215	- - -	- - -	- - -
	100.0%	25.0 24.8 - 25.2	24.5 24.3 - 24.7	7.8 7.6 - 8.1	7.4 6.4 - 7.8	7.52 7.46 - 7.60	7.30 7.01 - 7.42	168 166 - 172	53 53 - 54	64 61 - 65	< 0.10 < 0.10 - < 0.10
	Intake	25.0 24.8 - 25.1	24.6 24.4 - 24.9	7.9 7.6 - 8.2	7.4 6.5 - 7.8	7.51 7.45 - 7.60	7.29 7.01 - 7.41	167 162 - 172	54 52 - 55	62 57 - 65	< 0.10 < 0.10 - < 0.10
Ceriodaphnia dubia	Control	24.8 24.7 - 24.9	24.8 24.6 - 25.0	7.7 7.5 - 8.0	7.7 7.4 - 7.9	7.78 7.49 - 7.97	7.58 7.45 - 7.70	319 303 - 343	61 59 - 63	92 90 - 94	- - -
	11.3%	24.9 24.8 - 25.0	24.9 24.8 - 25.1	7.8 7.5 - 8.0	7.6 7.4 - 7.9	7.62 7.54 - 7.70	7.57 7.46 - 7.67	305 290 - 312	- - -	- - -	- - -
	22.6%	24.9 24.8 - 25.0	24.9 24.7 - 25.1	7.8 7.6 - 8.0	7.7 7.4 - 7.9	7.62 7.55 - 7.71	7.54 7.42 - 7.63	290 278 - 298	- - -	- - -	- - -
	45.2%	24.9 24.8 - 25.0	24.9 24.8 - 25.1	7.8 7.5 - 7.9	7.7 7.5 - 8.0	7.60 7.54 - 7.70	7.52 7.42 - 7.62	256 243 - 266	- - -	- - -	- - -
	72.6%	25.0 24.8 - 25.1	24.9 24.7 - 25.1	7.8 7.5 - 8.0	7.7 7.4 - 7.9	7.56 7.50 - 7.64	7.48 7.38 - 7.56	212 207 - 215	- - -	- - -	- - -
	100.0%	25.0 24.8 - 25.1	24.9 24.8 - 25.2	7.8 7.6 - 8.1	7.7 7.5 - 7.9	7.52 7.46 - 7.60	7.45 7.36 - 7.54	168 166 - 172	53 53 - 54	64 61 - 65	< 0.10 < 0.10 - < 0.10
	Intake	25.0 24.8 - 25.1	24.9 24.8 - 25.0	7.9 7.6 - 8.2	7.7 7.6 - 8.1	7.51 7.45 - 7.60	7.46 7.42 - 7.55	167 162 - 172	54 52 - 55	62 57 - 65	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.7	24.2	25.2
Ceriodaphnia dubia	24.9	24.6	25.2

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* Tests, UV-treated Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, April 15-22, 2008.

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 24.6 - 24.9	24.6 24.3 - 24.7	7.8 7.6 - 8.0	7.3 6.0 - 7.9	7.62 7.54 - 7.69	7.40 6.98 - 7.58	319 304 - 334	61 59 - 62	89 86 - 92	- - -
	11.3%	24.9 24.6 - 25.1	24.5 24.3 - 24.7	7.8 7.7 - 8.0	7.2 5.6 - 7.8	7.62 7.54 - 7.68	7.41 6.96 - 7.57	305 298 - 316	- - -	- - -	- - -
	22.6%	25.0 24.7 - 25.1	24.5 24.2 - 24.7	7.9 7.7 - 8.0	7.2 5.6 - 7.7	7.61 7.54 - 7.66	7.39 6.96 - 7.54	288 272 - 299	- - -	- - -	- - -
	45.2%	25.0 24.7 - 25.1	24.5 24.2 - 24.6	7.9 7.6 - 8.0	7.1 5.3 - 7.7	7.59 7.52 - 7.63	7.35 6.94 - 7.51	257 248 - 264	- - -	- - -	- - -
	72.6%	25.0 24.7 - 25.2	24.5 24.3 - 24.6	7.9 7.6 - 8.1	7.2 5.4 - 7.7	7.54 7.49 - 7.58	7.32 6.89 - 7.48	215 211 - 221	- - -	- - -	- - -
	100.0%	25.0 24.7 - 25.2	24.5 24.3 - 24.7	7.9 7.7 - 8.1	7.1 5.6 - 7.7	7.51 7.46 - 7.54	7.27 6.89 - 7.41	172 169 - 178	53 51 - 54	64 61 - 69	< 0.10 < 0.10 - < 0.10
	Intake	25.0 24.8 - 25.2	24.5 24.3 - 24.7	7.9 7.7 - 8.1	7.2 6.3 - 7.7	7.49 7.44 - 7.54	7.27 6.93 - 7.44	169 166 - 174	52 50 - 54	66 65 - 67	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.7	24.2	25.2

SUMMARY / CONCLUSIONS

Outfall 101 samples collected April 13-18, 2008, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were >100 percent. Exposure of daphnids to intake samples resulted in no significant difference from the control during this study period, but fathead minnow survival was significantly reduced when exposed to intake samples.

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. Although dose response and survival in these tests were not affected enough to jeopardize test acceptability or compliance with permit limits, fish survival was improved by UV treatment of intake and effluent samples prior to exposures. These results suggest that fish pathogen interference was a likely cause of mortality observed in untreated effluent and intake 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, 20th Edition, 1998.

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

Sequoyah Nuclear Plant Biomonitoring
April 15 – 22, 2008

Appendix B

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 –April 18, 2008

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 –April 18, 2008

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 –April 18, 2008

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 –April 18, 2008

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 –April 18, 2008

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 –April 18, 2008

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	-	-	-	-	-	-	-	-

Sequoyah Nuclear Plant Biomonitoring
April 15 – 22, 2008

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

Toxicity Testing Scheduling and Testing Communication Documentation

Initial that Information Correct			Project Specifications			
TVA Tox.	Contract Lab.	Sampler				
CLR	JS		TVA/Facility name:	Sequoyah Nuclear Plant		
CLR	JS		Permit number:	TN0026450		
CLR	JS		Project name:	SQN Tox. Compliance Tests		
CLR	JS		Date and time scheduled with facility:	January 30, 2008 @ 1148		
CLR	JS		Contract lab:	Environmental Testing Solutions (ETS)		
CLR	JS		Point of contact:	Jim Sumner		
CLR	JS		Date and time scheduled with lab:	January 30, 2008 @ 1302		
CLR	JS		Test Date and Type (chronic or acute):	**April 15, 2008/ chronics**		
CLR	JS		Test Species:	FH (w/ & w/o UV treatment), CD		
CLR	JS		Test concentrations:	101-11.3, 22.6, 45.2, 72.6, 100.0%; 100.0%intake-100% UV 101-11.3, 22.6, 45.2, 72.6, UV 100.0%intake-100%		
CLR	JS		Treatments that will occur at lab: (example-UV)	UV Treated FH only		
CLR			Sample collectors:	Chevales Williams		
CLR			Date and time scheduled with samplers:	January 30, 2008 @ 1417		
CLR	JS		Sampling points and volumes: **(composite samplers to be set on April 13, 2008.)**	Sample 1 101-2.5 gal Intake 2.5 gal	Sample 2 101-2.5 gal; intake- 2.5 gal;	Sample 3 101-5 gal Intake 2.5 gal
CLR			Delivery method:	Private Courier		
CLR			Contact information for delivery:			

STOP- (Reviewed and verify all information is correct and all parties involved agree). Document by using electronic mail at least seven (7) calendar days prior to test initiation. All e-mails are attached and represents a person sign off that the information is correct.

Sign off:
EES-W Toxicologist and/or AM&M Senior Toxicologist: Cynthia L Russell 03/14/2008

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: Chevy Williams, Roy Quinn

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): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project #3910 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	04/13/08-04/14/08	0808-0708	2 (2.5gal)	NA			X		080414.01	0.9/1.2°C	[illegible]	1428	*
SQN-INT-TOX	Comp	04/13/08-04/14/08	0922-0822	1 (2.5 gal)	NA			X		080414.02	1.1°C	[illegible]	1428	*

Sample Custody – Fill In From Top Down

*Custody seals intact. Samples received in good condition. [illegible]

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	04/14/08 10:25 am	Sonic Delivery [signature]	04/14/08 10:25
Sonic Delivery [signature]	04/14/08 1428	ETS [signature]	04/14/08 1428

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

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
04-14-08	1428	J. Sumner	TVA Courier	0.9/1.2	3810	080414.01	TVA - Sequoyah Nuclear Plant - Outfall 101	TN	
04-14-08	1428	J. Sumner	TVA Courier	1.1	3810	080414.02	TVA - Sequoyah Nuclear Plant - Intake	TN	

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn

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): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project# 3810 Laboratory Use				
	---	Date	Time	---	---	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	04/15/08-04/16/08	0732-0632	2 (2.5gal)	NA			X		080416.13	1.1/1.6°C	[illegible]	1413	*
SQN-INT-TOX	Comp	04/15/08-04/16/08	0752-0652	1 (2.5 gal)	NA			X		080416.14	2.1	[illegible]	1413	*

Sample Custody – Fill In From Top Down

* Custody seals intact. Samples received in good condition. [illegible]

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	04/16/08 09:50am	Sonic Delivery [signature]	04/16/08 09:50
Sonic Delivery [signature]	04/16/08 1413	ETS [signature] ETS	04/16/08 1413

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
04-16-08	0952	K. Keenan	Fed - Ex	1.4	3814	080416.01	Duke Energy Corporation - Allen Steam Station	NC	
04-16-08	0952	K. Keenan	Fed - Ex	0.9	3815	080416.02	Duke Energy Corporation - Riverbend Steam Station	NC	
04-16-08	0952	K. Keenan	Fed - Ex	0.6	3816	080416.04	Tritest, Inc. - Goldsboro WWTP - Outfall 001	NC	
04-16-08	0952	K. Keenan	Fed - Ex	0.6	3817	080416.04	Tritest, Inc. - Goldsboro WWTP - Outfall 002	NC	
04-16-08	0952	K. Keenan	Fed - Ex	0.3	3818	080416.05	Guilford Mills East	NC	
04-16-08	0952	K. Keenan	Fed - Ex	0.3	3819	080416.06	Guilford Mills East - Secondary Clarifiers	NC	
04-16-08	0952	K. Keenan	Fed - Ex	0.5	3820	080416.07	TVA - Colbert Fossil Plant - Outfall 001	AL	
04-16-08	0952	K. Keenan	Fed - Ex	0.4	3820	080416.08	TVA - Colbert Fossil Plant - Upstream	AL	
04-16-08	1030	K. Keenan	UPS	0.6	3821	080416.09	Enviro Chemists - South Mills Water Association WTP	NC	
04-16-08	1030	K. Keenan	UPS	0.4	3822	080416.09	City of Henderson - Nutbrush Creek WWTP	NC	
04-16-08	1030	K. Keenan	UPS	0.4	3823	080416.10	City of Henderson - Nutbrush Creek WWTP - Ianis	NC	
04-16-08	1030	K. Keenan	UPS	0.4	3824	080416.11	City of Henderson - Nutbrush Creek WWTP - Kennametal	NC	
04-16-08	1030	K. Keenan	UPS	0.4	3825	080416.12	City of Henderson - Nutbrush Creek WWTP - Walmart	NC	
04-16-08	1413	J. Sumner	TVA Courier	1.1/1.6	3810	080416.13	TVA - Sequoyah Nuclear Plant - Outfall 101	TN	
04-16-08	1413	J. Sumner	TVA Courier	2.1	3810	080416.14	TVA - Sequoyah Nuclear Plant - Intake	TN	

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Chevy Williams, Roy Quinn

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): Sonic Delivery

General Comments:

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project # 3810 Laboratory Use				
	----	Date	Time	----	----	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-101-TOX	Comp	04/17/08-04/18/08	0725-0625	2 (2.5gal)	NA			X		080418.01	2.0/1.4°C	[illegible]	1332	*
										080418.02	1.1°C	[illegible]	1332	*
SQN-INT-TOX	Comp	04/17/08-04/18/08	0740-0640	1 (2.5 gal)	NA			X		* Custody seals intact. Samples received in good condition. [illegible]				

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Chevy Williams [signature]	04/18/08 09:25 am	Sonic Delivery [signature]	04/18/08 9:25
Sonic Delivery [signature]	04/18/08 1332	ETS [signature]	04/18/08 1332

Environmental Testing Solutions, Inc.

Whole Effluent Toxicity Sample Receipt Log

Date received	Time received	Received by	Received from	Sample temperature (°C)	Project number	Sample number	Sample name and description	State	Comments
04-18-08	1332	J. Sumner	TVA Courier	2.0/1.4	3810	.080418.01	TVA - Sequoyah Nuclear Plant - Outfall 101	TN	
04-18-08	1332	J. Sumner	TVA Courier	1.1	3810	.080418.02	TVA - Sequoyah Nuclear Plant - Intake	TN	

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 3810

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	~~335~~ 565	1130	1815	2500	
Diluent volume (mL)	2217.5	~~2165~~ 1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	19.25 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	04-14-08 1600	Incubator number:	3B
Organism source:	ATOX BATCH Pp 04-14-08	*Artemia* lot number:	BG0204V
Transfer bowl information:	pH = 7.89 Temperature = 24.2 °C	Total drying time:	24 HOURS
		Date / Time in: 04-22-08	1200
Average transfer volume:	8.6 ml	Date / Time out: 04-23-08	1200
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	04-15-08	—	1230	1115	04-07-08	080414.01 + 02	JL
1	04-16-08	0800	1400	1108	04-07-08	080414.01 + 02	JL
2	04-17-08	0800	1400	1202	04-13-08 B	080416.13 + 14	JL
3	04-18-08	0810	1415	1151	04-13-08 B	080416.13 + 14	JL
4	04-19-08	0800	1400	1153	04-16-08 A	080418.01 + 02	JL
5	04-20-08	0900	1500	1155	04-16-08 A	080418.01 + 02	JL
6	04-21-08	0900	1500	1151	04-16-08 A	080418.01 + 02	JL
7	04-22-08			1138			JL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.810		NOEC	100%
Average weight per surviving larvae:	0.810	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 04-15-08

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	CONTROL				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) Color identification: ~~magenta~~ Analyst: MM	15.81	13.40	14.22	14.77	14.73	15.34	14.76	12.45	14.03	15.13	13.98	14.50
B = Pan + Larvae weight (mg) Analyst: MM	24.27	21.50	21.70	23.12	22.75	23.59	22.89	20.43	22.41	22.25	21.91	23.13
Larvae weight (mg) = A – B	8.46	8.10	7.48	8.35	8.02	8.25	8.13	7.98	8.38	7.12	7.93	8.63
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.846	0.810	0.748	0.835	0.802	0.825	0.813	0.798	0.838	0.712	0.793	0.863
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.810				0.810		0%		0.802		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:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 04-15-08

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	7 3dFG	10	10	9 1dFG	10	10	10	10	10
4	10	10	10	7	10	10	9	10	10	9 1dFG ~~10~~	10	10
5	10	10	10	7	10	10	9	10	9 1dFG	9	10	10
6	10	10	10	7	10	9 1dFG	9	10	9	9	10	10
7	10	9 1dFG	9 1dFG	7	10	9	8 1dFG	10	9	8 1dFG	10	10
A = Pan weight (mg) Color identification: magenta Analyst: MM	14.12	13.85	13.51	14.85	13.29	14.48	13.38	14.79	14.30	15.06	15.92	14.19
B = Pan + Larvae weight (mg) Analyst: MM	22.84	21.07	20.79	20.76	21.20	21.90	19.59	22.52	22.17	21.23	24.65	22.44
Larvae weight (mg) = A – B	8.72	7.22	7.28	5.91	7.91	7.42	6.21	7.73	7.87	6.17	8.73	8.25
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.872	0.722	0.728	0.591	0.791	0.742	0.621	0.773	0.787	0.617	0.873	0.825
Average weight per initial number of larvae (mg)	0.728				0.732				0.776			
Percent reduction from control (%)			10.1%				9.6%				4.2%	

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

Calculations and data reviewed: JH

Comments: * POSSIBLE PATHOGENIC INFECTION. MINNOWS THAT DIED IN THE EFFLUENT AND INTAKE WERE HEAVILY FUNGUSED.

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 04-15-08

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	7 3dfg	10	10
4	7 3dfg	7	10	9 1dfg
5	6 1dfg	6 1dfg	8 2dfg	4 5dfg
6	5 1dfg	5 1dfg	6 2dfg	3 1dfg
7	5	5 1dfg	6	3
A = Pan weight (mg) Color identification: MAGENTA Analyst: [illegible]	Y 15.66	Z 13.20	A 15.24	B 14.24
B = Pan + Larvae weight (mg) Analyst: MM	20.05	18.50	20.49	16.60
Larvae weight (mg) = A – B	4.39	~~1.060~~ 5.30	~~8.158~~ 5.25	2.36
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.439	0.530	0.525	0.236
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.433		46.6%	

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

Calculations and data reviewed: [illegible]

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
April 15-22, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	4/15/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	4/22/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
11.3	1.0000	1.0000	1.0000	1.0000
22.6	1.0000	1.0000	1.0000	1.0000
45.2	1.0000	0.9000	0.9000	0.7000
72.6	1.0000	0.9000	0.8000	1.0000
100	0.9000	0.8000	1.0000	1.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
11.3	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
22.6	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
45.2	0.8750	0.8750	1.2253	0.9912	1.4120	14.199	4	12.00	10.00	5	40
72.6	0.9250	0.9250	1.2951	1.1071	1.4120	11.347	4	14.00	10.00	3	40
100	0.9250	0.9250	1.2951	1.1071	1.4120	11.347	4	14.00	10.00	3	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.84818864	0.884	-0.6760745	1.16084056
Equality of variance cannot be confirmed				

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

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.27414145	0.56913392	0.15863894	2.38964395	0	6.59494317	7.81472778	0.09	2.94791372	0.78484222	7
Intercept	1.24394095	1.01467616	-0.7448244	3.23270626							

TSCR

Point	Probits	%	95% Fiducial Limits	
EC01	2.674	13.2463943	0.00037079	29.4709841
EC05	3.355	45.3903092	4.83309592	86.1712267
EC10	3.718	87.5181143	50.3972396	2287.3461
EC15	3.964	136.294103	75.7448833	67622.7886
EC20	4.158	193.808963	96.3464778	1084316.72
EC25	4.326	262.147478	116.213218	11945654.9
EC40	4.747	561.146453	180.769874	485165195
EC50	5.000	886.979795	233.559799	485165195
EC60	5.253	1402.01051	300.726925	485165195
EC75	5.674	3001.10884	455.757808	485165195
EC80	5.842	4059.32305	536.985968	485165195
EC85	6.036	5772.32087	649.794482	485165195
EC90	6.282	8989.37254	825.503063	485165195
EC95	6.645	17332.6195	1175.94644	485165195
EC99	7.326	59392.2837	2279.34489	485165195

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
April 15-22, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	4/15/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	4/22/2008	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	0.8460	0.8100	0.7480	0.8350
11.3	0.8020	0.8250	0.8130	0.7980
22.6	0.8380	0.7120	0.7930	0.8630
45.2	0.8720	0.7220	0.7280	0.5910
72.6	0.7910	0.7420	0.6210	0.7730
100	0.7870	0.6170	0.8730	0.8250

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8098	1.0000	0.8098	0.7480	0.8460	5.414	4				0.8098	1.0000
11.3	0.8095	0.9997	0.8095	0.7980	0.8250	1.498	4	0.004	2.410	0.1355	0.8095	0.9997
22.6	0.8015	0.9898	0.8015	0.7120	0.8630	8.275	4	0.147	2.410	0.1355	0.8015	0.9898
45.2	0.7283	0.8994	0.7283	0.5910	0.8720	15.765	4	1.450	2.410	0.1355	0.7452	0.9202
72.6	0.7318	0.9037	0.7318	0.6210	0.7910	10.462	4	1.388	2.410	0.1355	0.7452	0.9202
100	0.7755	0.9577	0.7755	0.6170	0.8730	14.361	4	0.609	2.410	0.1355	0.7452	0.9202

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93530476	0.884	-0.5773312	0.65667479
Bartlett's Test indicates equal variances (p = 0.06)	10.5668974	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	0.1354619	0.16728855	0.00571994	0.00631874	0.49915776	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	35.533			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Intake - Non-treated
April 15-22, 2008

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	4/15/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	4/22/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
100	0.5000	0.5000	0.6000	0.3000

			Transform: Arcsin Square Root						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			
*100	0.4750	0.4750	0.7591	0.5796	0.8861	16.957	4	10.144	2.353	0.1515

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.79137957	0.749	-1.1776705	3.92758425
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Heteroscedastic t Test indicates significant differences	0.06820701	0.0699559	0.852525	0.00828539	5.3E-05	1, 6
Treatments vs D-Control						

TVA / Sequoyah Nuclear Plant, Intake - Non-treated
April 15-22, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	4/15/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	4/22/2008	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	0.8460	0.8100	0.7480	0.8350
100	0.4390	0.5300	0.5250	0.2360

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8098	1.0000	0.8098	0.7480	0.8460	5.414	4				0.8098	1.0000
*100	0.4325	0.5341	0.4325	0.2360	0.5300	31.791	4	5.228	1.943	0.1402	0.4325	0.5341

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.87680268	0.749	-1.3643531	2.29151784
F-Test indicates equal variances (p = 0.09)	9.83858776	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences Treatments vs D-Control	0.14021648	0.17316022	0.28463513	0.01041363	0.0019608	1, 6

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)		Skew
IC05*	10.732	1.627	5.191	17.900	0.1896
IC10*	21.465	3.254	10.382	35.799	0.1896
IC15*	32.197	4.881	15.572	53.699	0.1896
IC20*	42.929	6.508	20.763	71.598	0.1896
IC25*	53.661	8.136	25.954	89.498	0.1896
IC40*	85.858				
IC50	>100				

* indicates IC estimate less than the lowest concentration

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
April 15-22, 2008

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: 3810
Reveiwed by: J Turner

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	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	15.81	24.27	8.46	0.846	0.810	5.4	0.846	100.0	0.810	5.4	Not applicable
	B	10	10	13.40	21.50	8.10	0.810			0.810				
	C	10	10	14.22	21.70	7.48	0.748			0.748				
	D	10	10	14.77	23.12	8.35	0.835			0.835				
11.3%	E	10	10	14.73	22.75	8.02	0.802	0.810	1.5	0.802	100.0	0.810	1.5	0.0
	F	10	10	15.34	23.59	8.25	0.825			0.825				
	G	10	10	14.76	22.89	8.13	0.813			0.813				
	H	10	10	12.45	20.43	7.98	0.798			0.798				
22.6%	I	10	10	14.03	22.41	8.38	0.838	0.802	8.3	0.838	100.0	0.802	8.3	1.0
	J	10	10	15.13	22.25	7.12	0.712			0.712				
	K	10	10	13.98	21.91	7.93	0.793			0.793				
	L	10	10	14.50	23.13	8.63	0.863			0.863				
45.2%	M	10	10	14.12	22.84	8.72	0.872	0.832	3.9	0.872	87.5	0.728	15.8	10.1
	N	10	9	13.85	21.07	7.22	0.802			0.722				
	O	10	9	13.51	20.79	7.28	0.809			0.728				
	P	10	7	14.85	20.76	5.91	0.844			0.591				
72.6%	Q	10	10	13.29	21.20	7.91	0.791	0.791	3.0	0.791	92.5	0.732	10.5	9.6
	R	10	9	14.48	21.90	7.42	0.824			0.742				
	S	10	8	13.38	19.59	6.21	0.776			0.621				
	T	10	10	14.79	22.52	7.73	0.773			0.773				
100%	U	10	9	14.30	22.17	7.87	0.874	0.836	5.8	0.787	92.5	0.776	14.4	4.2
	V	10	8	15.06	21.23	6.17	0.771			0.617				
	W	10	10	15.92	24.65	8.73	0.873			0.873				
	X	10	10	14.19	22.44	8.25	0.825			0.825				
100%.Intake	Y	10	5	15.66	20.05	4.39	0.878	0.900	12.8	0.439	47.5	0.433	31.8	46.6
	Z	10	5	13.20	18.50	5.30	1.060			0.530				
	AA	10	6	15.24	20.49	5.25	0.875			0.525				
	BB	10	3	14.24	16.60	2.36	0.787			0.236				

Outfall 101:
Dunnett's MSD value: 0.1355
PMSD: 16.7

Intake:
Dunnett's MSD value: 0.1402
PMSD: 17.3

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

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.

Species: *Pimephales promelas* Date: 04-15-08
Client: TVA / Sequoyah Nuclear Plant – Non-treated

Daily Chemistry:

		Day 0		Day 1		Day 2	
	Analyst	JL	MM	MM	LAB	LAB	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.92	7.51	~~7.54~~ MM	7.54	7.70	7.41
	DO (mg/L)	8.0	7.9	7.6 (7.49)	7.9	7.8	7.8
	Conductivity (µmhos/cm)	322		343		322	
	Alkalinity (mg $CaCO_3$/L)	59				62	
	Hardness (mg $CaCO_3$/L)	92				94	
	Temperature (°C)	24.8	24.6	24.6	24.8	24.7	24.6
11.3%	pH (S.U.)	7.66	7.52	~~7.55~~ MM	7.53	7.63	7.39
	DO (mg/L)	7.9	7.7	7.9 (7.54)	7.9	7.5	7.7
	Conductivity (µmhos/cm)	312		309		312	
	Temperature (°C)	24.9	24.4	24.7	24.7	24.7	24.6
22.6%	pH (S.U.)	7.67	7.51	~~7.54~~ MM	7.49	7.64	7.39
	DO (mg/L)	7.9	7.7	7.8 (7.55)	7.9	7.6	7.6
	Conductivity (µmhos/cm)	293		291		295	
	Temperature (°C)	25.0	24.5	24.7	24.7	24.8	24.4
45.2%	pH (S.U.)	7.64	7.50	~~7.50~~ MM	7.45	7.63	7.36
	DO (mg/L)	7.9	7.6	7.9 (7.54)	7.8	7.7	7.7
	Conductivity (µmhos/cm)	266		258		257	
	Temperature (°C)	25.0	24.5	24.7	24.6	24.8	24.6
72.6%	pH (S.U.)	7.62	7.46	~~7.45~~ MM	7.43	7.58	7.30
	DO (mg/L)	8.0	7.6	7.9 (7.50)	7.8	7.8	7.6
	Conductivity (µmhos/cm)	215		214		210	
	Temperature (°C)	25.0	24.5	24.8	24.7	24.8	24.7
100%	pH (S.U.)	7.58	7.42	7.46	7.42	7.54	7.29
	DO (mg/L)	8.1	7.5	7.8	7.8	7.8	7.8
	Conductivity (µmhos/cm)	169		167		167	
	Alkalinity (mg $CaCO_3$/L)	53				54	
	Hardness (mg $CaCO_3$/L)	65				61	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.2	24.3	24.9	24.7	24.9	24.5
100% Intake	pH (S.U.)	7.57	7.34	7.45	7.40	7.53	7.28
	DO (mg/L)	8.2	7.3	7.9	7.8	7.9	7.8
	Conductivity (µmhos/cm)	162		165		168	
	Alkalinity (mg $CaCO_3$/L)	52				54	
	Hardness (mg $CaCO_3$/L)	57				65	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.5	24.9	24.9	24.9	24.5
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 04-15-08
Client: TVA / Sequoyah Nuclear Plant – Non-treated

		Day							
		3		4		5		6	
	Analyst	MM	LAB	LAB	MM	MM	MM	MM	MM
Concentration	Parameter								
CONTROL	pH (S.U.)	7.86	7.53	7.83	7.33	7.97	7.59 MM	7.69	7.18
	DO (mg/L)	7.9	7.5	7.8	7.1	7.6	7.8	7.5	6.4
	Conductivity (µmhos/cm)	320		310		303		314	
	Alkalinity (mg $CaCO_3$/L)			63					
	Hardness (mg $CaCO_3$/L)			90					
	Temperature (°C)	24.7	24.7	24.9	24.4	24.7	24.5	24.8	24.5
11.3%	pH (S.U.)	7.58	7.51	7.70	7.30	7.60	7.57 MM	7.61	7.17
	DO (mg/L)	7.9	7.6	8.0	6.8	7.6	7.7	7.6	6.6
	Conductivity (µmhos/cm)	312		300		290		* 344 (29)	
	Temperature (°C)	24.7	24.4	24.9	24.2	24.8	24.7	25.0	24.5
22.6%	pH (S.U.)	7.58	7.54	7.71	7.30	7.60	7.57 MM	7.61	7.14
	DO (mg/L)	7.8	7.7	8.0	6.8	7.6	7.7	7.6	6.4
	Conductivity (µmhos/cm)	298		283		278		* 322 (28)	
	Temperature (°C)	24.8	24.5	24.9	24.2	24.8	24.3	25.0	24.5
45.2%	pH (S.U.)	7.57	7.52	7.70	7.30	7.56	7.53 MM	7.58	7.03
	DO (mg/L)	7.9	7.7	7.9	6.9	7.6	7.7	7.5	6.2
	Conductivity (µmhos/cm)	261		249		243		* 284 (26)	
	Temperature (°C)	24.8	24.5	24.9	24.2	24.9	24.6	25.0	24.5
72.6%	pH (S.U.)	7.52	7.48	7.64	7.19	7.54	7.50 MM	7.55	7.01
	DO (mg/L)	7.9	7.6	7.9	6.9	7.6	7.6	7.5	5.9
	Conductivity (µmhos/cm)	214		211		207		* 238 (23)	
	Temperature (°C)	24.8	24.3	24.9	24.4	24.9	24.6	25.1	24.5
100%	pH (S.U.)	7.48	7.39	7.60	7.10	7.46	7.44 MM	7.51	7.01
	DO (mg/L)	7.9	7.5	7.9	6.9	7.7	7.6	7.6	6.4
	Conductivity (µmhos/cm)	169		167		166		* 189 (17)	
	Alkalinity (mg $CaCO_3$/L)			53					
	Hardness (mg $CaCO_3$/L)			65					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.7	25.0	24.4	24.9	24.6	25.1	24.5
100% Intake	pH (S.U.)	7.47	7.41	7.60	7.17	7.45	7.41	7.50	7.01
	DO (mg/L)	~~1.67~~ MM 8.0	7.6	~~7.68~~ 8.0	6.8	7.8	7.8	7.6	6.5
	Conductivity (µmhos/cm)	167		168		165		* 189 (17)	
	Alkalinity (mg $CaCO_3$/L)			55					
	Hardness (mg $CaCO_3$/L)			63					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.6	25.0	24.4	25.0	24.6	25.1	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* CELL CONSTANT INCORRECT

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
April 15-22, 2008

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: 3810
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)	7.92	7.51	7.49	7.54	7.70	7.41	7.86	7.53	7.83	7.33	7.97	7.52	7.69	7.18
	DO (mg/L)	8.0	7.9	7.6	7.9	7.8	7.8	7.9	7.5	7.8	7.1	7.6	7.8	7.5	6.4
	Conductivity (µmhos/cm)	322		343		322		320		310		303		314	
	Alkalinity (mg/L $CaCO_3$)	59				62				63					
	Hardness (mg/L $CaCO_3$)	92				94				90					
	Temperature (°C)	24.8	24.6	24.6	24.8	24.7	24.6	24.7	24.7	24.9	24.4	24.7	24.5	24.8	24.5
11.3%	pH (SU)	7.66	7.52	7.84	7.53	7.63	7.39	7.58	7.51	7.70	7.30	7.60	7.53	7.61	7.70
	DO (mg/L)	7.9	7.7	7.9	7.9	7.5	7.7	7.9	7.6	8.0	6.8	7.6	7.7	7.6	6.6
	Conductivity (µmhos/cm)	312		309		312		312		300		290		299	
	Temperature (°C)	24.9	24.4	24.7	24.7	24.7	24.6	24.7	24.4	24.9	24.2	24.8	24.7	25.0	24.5
22.6%	pH (SU)	7.67	7.51	7.55	7.49	7.64	7.39	7.58	7.54	7.71	7.30	7.60	7.51	7.61	7.14
	DO (mg/L)	7.9	7.7	7.8	7.9	7.6	7.6	7.8	7.7	8.0	6.8	7.6	7.7	7.6	6.4
	Conductivity (µmhos/cm)	293		291		295		298		283		278		293	
	Temperature (°C)	25.0	24.5	24.7	24.7	24.8	24.4	24.8	24.5	24.9	24.2	24.8	24.3	25.0	24.5
45.2%	pH (SU)	7.64	7.50	7.54	7.45	7.63	7.36	7.57	7.52	7.70	7.30	7.56	7.47	7.58	7.03
	DO (mg/L)	7.9	7.6	7.9	7.8	7.7	7.7	7.9	7.7	7.9	6.9	7.6	7.7	7.5	6.2
	Conductivity (µmhos/cm)	266		258		257		261		249		243		260	
	Temperature (°C)	25.0	24.5	24.7	24.6	24.8	24.6	24.8	24.5	24.9	24.2	24.9	24.6	25.0	24.5
72.6%	pH (SU)	7.62	7.46	7.50	7.43	7.58	7.30	7.52	7.48	7.64	7.19	7.54	7.40	7.55	7.01
	DO (mg/L)	8.0	7.6	7.9	7.8	7.8	7.6	7.9	7.6	7.9	6.9	7.6	7.6	7.5	5.9
	Conductivity (µmhos/cm)	215		214		210		214		211		207		215	
	Temperature (°C)	25.0	24.5	24.8	24.7	24.8	24.7	24.8	24.3	24.9	24.4	24.9	24.6	25.1	24.5
100%	pH (SU)	7.58	7.42	7.46	7.42	7.54	7.29	7.48	7.39	7.60	7.18	7.46	7.38	7.51	7.01
	DO (mg/L)	8.1	7.5	7.8	7.8	7.8	7.8	7.9	7.5	7.9	6.9	7.7	7.6	7.6	6.4
	Conductivity (µmhos/cm)	169		167		167		169		167		166		172	
	Alkalinity (mg/L $CaCO_3$)	53				54				53					
	Hardness (mg/L $CaCO_3$)	65				61				65					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.2	24.3	24.9	24.7	24.9	24.5	24.8	24.7	25.0	24.4	24.9	24.6	25.1	24.5
100% Intake	pH (SU)	7.57	7.34	7.45	7.40	7.53	7.28	7.47	7.41	7.60	7.17	7.45	7.41	7.50	7.01
	DO (mg/L)	8.2	7.3	7.9	7.8	7.9	7.8	8.0	7.6	8.0	6.8	7.8	7.8	7.6	6.5
	Conductivity (µmhos/cm)	162		165		168		167		168		165		172	
	Alkalinity (mg/L $CaCO_3$)	52				54				55					
	Hardness (mg/L $CaCO_3$)	57				65				63					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.5	24.9	24.9	24.9	24.5	24.8	24.6	25.0	24.4	25.0	24.6	25.1	24.5

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 3810

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	
Effluent volume (mL)	282.5	~~332~~ 565	1130	1815	2500	
Diluent volume (mL)	2217.5	~~2168~~ 1935	1370	685	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	< 24-HOURS OLD	Randomizing template:	PURPLE
Date and times organisms were born between:	~~04-14~~ 04-15-08 0730 TO 1030	Incubator number and shelf location:	2D2
Organism Source Culture board: 04-08-08A	Cups: 1/2/3/4/5/8/9/13/14/15 Rep: 1/2/3/4/5/6/7/8/9/10	YCT batch:	03-14-08
Transfer bowl information:	pH = 7.91 Temperature = 24.8	*Selenastrum* batch:	03-24-08

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used	Sample numbers used	Analyst
0	04-15-08	1100	04-07-08	080414.01 + 02	dl
1	04-16-08	1009	04-07-08	080414.01 + 02	dl
2	04-17-08	1012	04-13-08B	080416.13 + 14	dl
3	04-18-08	1001	04-13-08B	080416.13 + 14	dl
4	04-19-08	1052	04-16-08A	080418.01 + 02	dl
5	04-20-08	1004	04-16-08A	080418.01 + 02	dl
6	04-21-08	1014	04-16-08A	080418.01 + 02	dl
7	04-22-08	1003			dl

Control information:	1	2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100% ~~32.8~~	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	32.5	33.3	≥ 15.0 offspring/female	ChV	>100%
% CV:	5.8%	4.9%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 04-15-08

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	5	4	4	5	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	15	0	12	12	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	14	14	13	12	0	13	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	15	14	16	16	15	15	13	16	14
Total young produced		35	33	32	34	32	34	33	~~3~~ 28	32	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.5

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	4	6	4	4	4	4	5	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	15	15	17	13	0	14	13	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	15	0	0	0	0	15	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	16	20	17	19	17	16	18	16	19
Total young produced		36	37	39	36	~~42~~ 40	34	36	37	33	37
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	36.5
% Reduction from Control:	-12.3%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 04-15-08

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	6	4	5	4	4	5	5	5	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	15	0	0	16	0	0	15	16	0	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	18	15	0	15	15	0	0	16	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	17	16	20	17	18	20	17	21	19
Total young produced		38	39	36	40	36	38	40	38	41	41
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	38.7
% Reduction from Control:	-19.1%

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	4	4	5	6	4	4	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	15	0	16	0	0	0	0	17	15	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	14	0	17	15	13	17	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	21	17	18	20	18	20	17	19	19	22
Total young produced		41	35	38	42	39	37	38	40	39	41
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	39.0
% Reduction from Control:	-20.0%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 04-15-08

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	5	4	5	4	4	4	6	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	14	0	15	17	0	0	15	18	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	0	17	0	0	14	16	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	19	20	19	19	21	18	22	18	18
Total young produced		39	38	42	38	41	39	38	41	42	38
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	39.6
% Reduction from Control:	-21.8%

CONC: 100% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	4	5	4	4	4	6	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	17	16	16	14	16	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	14	18	15	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	21	19	18	22	20	19	21	19	22	18
Total young produced		43	38	40	42	41	39	41	39	44	38
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	40.5
% Reduction from Control:	-24.6%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 04-15-08

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	5	4	4	4	4	5	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	14	13	0	16	13	15	14	14	0	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	15	0	0	0	0	0	15	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	14	17	14	16	14	14	14	16
Total young produced		33	33	33	37	31	35	33	32	33	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

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

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	6	4	4	5	5	5	5	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	17	15	0	14	15	15	16	13	0	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	17	0	0	0	0	0	13	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	18	21	18	22	19	19	21	20	18	20
Total young produced		41	40	39	41	39	39	42	37	36	39
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	39.3
% Reduction from Control:	-18.0%

TVA / Sequoyah Nuclear Plant, Outfall 101
April 15-22, 2008
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/15/2008	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	4/22/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	35.000	33.000	32.000	34.000	32.000	34.000	33.000	28.000	32.000	32.000
11.3	36.000	37.000	39.000	36.000	40.000	34.000	36.000	37.000	33.000	37.000
22.6	38.000	39.000	36.000	40.000	36.000	38.000	40.000	38.000	41.000	41.000
45.2	41.000	35.000	38.000	42.000	39.000	37.000	38.000	40.000	39.000	41.000
72.6	39.000	38.000	42.000	38.000	41.000	39.000	38.000	41.000	42.000	38.000
100	43.000	38.000	40.000	42.000	41.000	39.000	41.000	39.000	44.000	38.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	32.500	1.0000	32.500	28.000	35.000	5.847	10				37.800	1.0000
11.3	36.500	1.1231	36.500	33.000	40.000	5.667	10	-4.579	2.287	1.997	37.800	1.0000
22.6	38.700	1.1908	38.700	36.000	41.000	4.726	10	-7.098	2.287	1.997	37.800	1.0000
45.2	39.000	1.2000	39.000	35.000	42.000	5.406	10	-7.442	2.287	1.997	37.800	1.0000
72.6	39.600	1.2185	39.600	38.000	42.000	4.325	10	-8.128	2.287	1.997	37.800	1.0000
100	40.500	1.2462	40.500	38.000	44.000	5.107	10	-9.159	2.287	1.997	37.800	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt.
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.82764852	1.035	-0.188985	-0.4219705
Bartlett's Test indicates equal variances (p = 0.99)	0.58125877	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	1.99735188	0.06145698	85.12	3.81481481	4.7E-12	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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

TVA / Sequoyah Nuclear Plant, Intake
April 15-22, 2008
Statistical Analyses

Environmental Testing Solutions, Inc.

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/15/2008	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	4/22/2008	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:	Non-treated				

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	33.000	33.000	33.000	37.000	31.000	35.000	33.000	32.000	33.000	33.000
100	41.000	40.000	39.000	41.000	39.000	39.000	42.000	37.000	36.000	39.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	33.300	1.0000	33.300	31.000	37.000	4.914	10				36.300	1.0000
100	39.300	1.1802	39.300	36.000	42.000	4.653	10	-7.732	1.734	1.346	36.300	1.0000

Auxiliary Tests	Statistic		Critical		Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91478437		0.868		0.27528238	0.39658886
F-Test indicates equal variances (p = 0.75)	1.24896264		6.54108953			
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	1.34568502	0.04041096	180	3.01111111	4.0E-07	1, 18

Linear Interpolation (200 Resamples)

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

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101
April 15-22, 2008

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	5	4	4	5	3	4	4	41
5	0	0	0	0	0	15	0	12	12	14	53
6	14	14	14	13	12	0	13	0	0	0	80
7	17	15	14	16	16	15	15	13	16	14	151
Total	35	33	32	34	32	34	33	28	32	32	325

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	4	6	4	4	4	4	5	5	4	4	44
5	0	0	15	15	17	13	0	14	13	14	101
6	16	15	0	0	0	0	15	0	0	0	46
7	16	16	20	17	19	17	16	18	16	19	174
Total	36	37	39	36	40	34	36	37	33	37	365

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	6	4	5	4	4	5	5	5	4	5	47
5	15	0	0	16	0	0	15	16	0	17	79
6	0	18	15	0	15	15	0	0	16	0	79
7	17	17	16	20	17	18	20	17	21	19	182
Total	38	39	36	40	36	38	40	38	41	41	387

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	4	4	5	6	4	4	4	5	5	46
5	15	0	16	0	0	0	0	17	15	14	77
6	0	14	0	17	15	13	17	0	0	0	76
7	21	17	18	20	18	20	17	19	19	22	191
Total	41	35	38	42	39	37	38	40	39	41	390

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	5	4	5	4	4	4	6	4	46
5	0	14	0	15	17	0	0	15	18	16	95
6	17	0	17	0	0	14	16	0	0	0	64
7	17	19	20	19	19	21	18	22	18	18	191
Total	39	38	42	38	41	39	38	41	42	38	396

100%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	4	5	4	4	4	6	6	5	48
5	0	0	0	0	17	16	16	14	16	15	94
6	17	14	18	15	0	0	0	0	0	0	64
7	21	19	18	22	20	19	21	19	22	18	199
Total	43	38	40	42	41	39	41	39	44	38	405

Control-2

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	4	4	4	4	5	4	4	5	43
5	14	13	0	16	13	15	14	14	0	12	111
6	0	0	15	0	0	0	0	0	15	0	30
7	15	15	14	17	14	16	14	14	14	16	149
Total	33	33	33	37	31	35	33	32	33	33	333

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	6	4	4	5	5	5	5	4	5	4	47
5	17	15	0	14	15	15	16	13	0	15	120
6	0	0	17	0	0	0	0	0	13	0	30
7	18	21	18	22	19	19	21	20	18	20	196
Total	41	40	39	41	39	39	42	37	36	39	393

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101
April 15-22, 2008

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: 3810

Reveiwed by: Yumre

Concentration (%)	Replicate number 1	2	3	4	5	6	7	8	9	10	Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from pooled controls (%)
Control - 1	35	33	32	34	32	34	33	28	32	32	100	32.5	5.8	Not applicable
11.3%	36	37	39	36	40	34	36	37	33	37	100	36.5	5.7	-12.3
22.6%	38	39	36	40	36	38	40	38	41	41	100	38.7	4.7	-19.1
45.2%	41	35	38	42	39	37	38	40	39	41	100	39.0	5.4	-20.0
72.6%	39	38	42	38	41	39	38	41	42	38	100	39.6	4.3	-21.8
100%	43	38	40	42	41	39	41	39	44	38	100	40.5	5.1	-24.6
Control - 2	33	33	33	37	31	35	33	32	33	33	100	33.3	4.9	Not applicable
100% Intake	41	40	39	41	39	39	42	37	36	39	100	39.3	4.7	-18.0

Outfall 101:
Dunnett's MSD value: 1.997
PMSD: 6.1

Intake:
Dunnett's MSD value: 1.346
PMSD: 4.0

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

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.

Species: *Ceriodaphnia dubia* Date: 04-15-08
Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day 0		Day 1		Day 2	
	Analyst	A	MM	MM	LAB	LAB	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.92	7.45	7.49	7.60	7.70	7.54
	DO (mg/L)	8.0	7.9	7.6	7.6	7.8	7.9
	Conductivity (µmhos/cm)	322		343		322	
	Alkalinity (mg $CaCO_3$/L)	59				62	
	Hardness (mg $CaCO_3$/L)	92				94	
	Temperature (°C)	24.7	24.7	24.7	24.9	24.7	24.6
11.3%	pH (S.U.)	7.66	7.46	7.54	7.59	7.63	7.53
	DO (mg/L)	7.9	7.8	7.9	7.7	7.5	7.9
	Conductivity (µmhos/cm)	312		309		312	
	Temperature (°C)	24.8	24.9	24.8	25.1	24.9	24.8
22.6%	pH (S.U.)	7.67	7.42	7.55	7.57	7.64	7.52
	DO (mg/L)	7.9	7.9	7.8	7.7	7.6	7.9
	Conductivity (µmhos/cm)	293		291		295	
	Temperature (°C)	24.8	24.9	24.8	25.0	24.9	24.8
45.2%	pH (S.U.)	7.64	7.42	7.54	7.53	7.63	7.49
	DO (mg/L)	7.9	7.9	7.9	7.7	7.7	8.0
	Conductivity (µmhos/cm)	266		258		257	
	Temperature (°C)	24.8	24.8	24.8	24.9	25.0	24.9
72.6%	pH (S.U.)	7.62	7.38	7.50	7.51	7.58	7.45
	DO (mg/L)	8.0	7.9	7.9	7.8	7.8	7.9
	Conductivity (µmhos/cm)	215		214		210	
	Temperature (°C)	24.9	25.0	24.8	24.7	25.0	24.7
100%	pH (S.U.)	7.58	7.36	7.46	7.47	7.54	7.41
	DO (mg/L)	8.1	7.8	7.8	7.9	7.8	7.8
	Conductivity (µmhos/cm)	169		167		167	
	Alkalinity (mg $CaCO_3$/L)	53				54	
	Hardness (mg $CaCO_3$/L)	65				61	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.9	24.9	24.8	25.1	25.1	24.9
100% Intake	pH (S.U.)	7.57	7.42	7.45	7.47	7.53	7.43
	DO (mg/L)	8.2	7.6	7.9	7.8	7.9	8.1
	Conductivity (µmhos/cm)	162		165		168	
	Alkalinity (mg $CaCO_3$/L)	52				54	
	Hardness (mg $CaCO_3$/L)	57				65	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	24.9	24.9	24.8	25.0	25.1	24.9
		Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated

Date: 04-15-08

		Day							
		3		4		5		6	
	Analyst	MM	VAB	VAB	KK	KK	MM	MM	KK
Concen-tration	Parameter								
CONTROL	pH (S.U.)	7.86	7.70	7.83	7.59	7.97	7.59	7.69	7.57
	DO (mg/L)	7.9	7.7	7.8	7.5	7.6	7.6	7.5	7.4
	Conductivity (µmhos/cm)	320		310		303		314	
	Alkalinity (mg $CaCO_3$/L)			63					
	Hardness (mg $CaCO_3$/L)			90					
	Temperature (°C)	24.7	25.0	24.8	24.8	24.8	24.6	24.9	24.8
11.3%	pH (S.U.)	7.58	7.67	7.70	7.59	7.60	7.57	7.61	7.57
	DO (mg/L)	7.9	7.8	8.0	7.5	7.6	7.4	7.6	7.4
	Conductivity (µmhos/cm)	312		300		290		299	
	Temperature (°C)	24.8	25.0	25.0	24.8	25.0	24.9	25.0	25.0
22.6%	pH (S.U.)	7.58	7.63	7.71	7.56	7.60	7.57	7.61	7.50
	DO (mg/L)	7.8	7.8	8.0	7.5	7.6	7.5	7.6	7.4
	Conductivity (µmhos/cm)	298		283		278		293	
	Temperature (°C)	24.8	24.8	25.0	24.7	25.0	24.8	25.0	25.1
45.2%	pH (S.U.)	7.57	7.62	7.70	7.56	7.56	7.53	7.58	7.50
	DO (mg/L)	7.9	7.8	7.9	7.5	7.6	7.6	7.5	7.5
	Conductivity (µmhos/cm)	261		249		243		260	
	Temperature (°C)	24.8	24.9	25.0	24.9	25.0	24.8	25.0	25.1
72.6%	pH (S.U.)	7.52	7.56	7.64	7.49	7.54	7.50	7.55	7.48
	DO (mg/L)	7.9	7.8	7.9	7.5	7.6	7.6	7.5	7.4
	Conductivity (µmhos/cm)	214		211		207		215	
	Temperature (°C)	24.9	25.1	25.1	24.9	25.1	24.9	25.0	25.0
100%	pH (S.U.)	7.48	7.54	7.60	7.44	7.46	7.44	7.51	7.46
	DO (mg/L)	7.9	7.8	7.9	7.5	7.7	7.7	7.6	7.6
	Conductivity (µmhos/cm)	169		167		166		172	
	Alkalinity (mg $CaCO_3$/L)			53					
	Hardness (mg $CaCO_3$/L)			65					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	24.8	25.1	24.9	25.1	24.8	25.0	25.2
100% Intake	pH (S.U.)	7.47	7.55	7.60	7.46	7.45	7.42	7.50	7.46
	DO (mg/L)	8.0	7.6	8.0	7.7	7.8	7.8	7.6	7.6
	Conductivity (µmhos/cm)	167		168		165		172	
	Alkalinity (mg $CaCO_3$/L)			55					
	Hardness (mg $CaCO_3$/L)			63					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	24.9	25.0	24.8	25.1	24.8	25.0	24.9
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
April 15-22, 2008

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: 3810
Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.92	7.45	7.49	7.60	7.70	7.54	7.86	7.70	7.83	7.59	7.97	7.59	7.69	7.57
	DO (mg/L)	8.0	7.9	7.6	7.6	7.8	7.9	7.9	7.7	7.8	7.5	7.6	7.6	7.5	7.4
	Conductivity (µmhos/cm)	322		343		322		320		310		303		314	
	Alkalinity (mg/L $CaCO_3$)	59				62				63					
	Hardness (mg/L $CaCO_3$)	92				94				90					
	Temperature (°C)	24.7	24.7	24.7	24.9	24.7	24.6	24.7	25.0	24.8	24.8	24.8	24.6	24.9	24.8
11.3%	pH (SU)	7.66	7.46	7.54	7.59	7.63	7.53	7.58	7.67	7.70	7.59	7.60	7.57	7.61	7.57
	DO (mg/L)	7.9	7.8	7.9	7.7	7.5	7.9	7.9	7.8	8.0	7.5	7.6	7.4	7.6	7.4
	Conductivity (µmhos/cm)	312		309		312		312		300		290		299	
	Temperature (°C)	24.8	24.9	24.8	25.1	24.9	24.8	24.8	25.0	25.0	24.8	25.0	24.9	25.0	25.0
22.6%	pH (SU)	7.67	7.42	7.55	7.57	7.64	7.52	7.58	7.63	7.71	7.56	7.60	7.57	7.61	7.50
	DO (mg/L)	7.9	7.9	7.8	7.7	7.6	7.9	7.8	7.8	8.0	7.5	7.6	7.5	7.6	7.4
	Conductivity (µmhos/cm)	293		291		295		298		283		278		293	
	Temperature (°C)	24.8	24.9	24.8	25.0	24.9	24.8	24.8	24.8	25.0	24.7	25.0	24.8	25.0	25.1
45.2%	pH (SU)	7.64	7.42	7.54	7.53	7.63	7.49	7.57	7.62	7.70	7.56	7.56	7.53	7.58	7.50
	DO (mg/L)	7.9	7.9	7.9	7.7	7.7	8.0	7.9	7.8	7.9	7.5	7.6	7.6	7.5	7.5
	Conductivity (µmhos/cm)	266		258		257		261		249		243		260	
	Temperature (°C)	24.8	24.8	24.8	24.9	25.0	24.9	24.8	24.9	25.0	24.9	25.0	24.8	25.0	25.1
72.6%	pH (SU)	7.62	7.38	7.50	7.51	7.58	7.45	7.52	7.56	7.64	7.49	7.54	7.50	7.55	7.48
	DO (mg/L)	8.0	7.9	7.9	7.8	7.8	7.9	7.9	7.8	7.9	7.5	7.6	7.6	7.5	7.4
	Conductivity (µmhos/cm)	215		214		210		214		211		207		215	
	Temperature (°C)	24.9	25.0	24.8	24.7	25.0	24.7	24.9	25.1	25.1	24.9	25.1	24.9	25.0	25.0
100%	pH (SU)	7.58	7.36	7.46	7.47	7.54	7.41	7.48	7.54	7.60	7.44	7.46	7.44	7.51	7.46
	DO (mg/L)	8.1	7.8	7.8	7.9	7.8	7.8	7.9	7.8	7.9	7.5	7.7	7.7	7.6	7.6
	Conductivity (µmhos/cm)	169		167		167		169		167		166		172	
	Alkalinity (mg/L $CaCO_3$)	53				54				53					
	Hardness (mg/L $CaCO_3$)	65				61				65					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.9	24.9	24.8	25.1	25.1	24.9	24.9	24.8	25.1	24.9	25.1	24.8	25.0	25.2
100% Intake	pH (SU)	7.57	7.42	7.45	7.47	7.53	7.43	7.47	7.55	7.60	7.46	7.45	7.42	7.50	7.46
	DO (mg/L)	8.2	7.6	7.9	7.8	7.9	8.1	8.0	7.6	8.0	7.7	7.8	7.8	7.6	7.6
	Conductivity (µmhos/cm)	162		165		168		167		168		165		172	
	Alkalinity (mg/L $CaCO_3$)	52				54				55					
	Hardness (mg/L $CaCO_3$)	57				65				63					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.9	24.9	24.8	25.0	25.1	24.9	24.9	24.9	25.0	24.8	25.1	24.8	25.0	24.9

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 3810

County: Hamilton
Treatment: UV-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	11.3	22.6	45.2	72.6	100	Each concentration was treated
Effluent volume (mL)	282.5	~~335~~ 565	1130	1815	2500	for 2 minutes with a UV sterilizer
Diluent volume (mL)	2217.5	~~2165~~ 1935	1370	685	0	to remove pathogenic
Total volume (mL)	2500	2500	2500	2500	2500	interferences.

Test organism information:		*Test information:*	
Organism age:	19.75 HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	04-14-08 1600	Incubator number:	3C
Organism source:	ATOX BATCH Pp 04-14-08	*Artemia* lot number:	860204V
Transfer bowl information:	pH = 7.89 Temperature = 24.2 °C	Total drying time:	21-HOURS
		Date / Time in:	04-22-08 1200
Average transfer volume:	8.6 ml	Date / Time out:	04-23-08 1200
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Sample numbers used	Analyst
0	04-15-08	—	1230	1137	04-07-08	080414.01&02	JH
1	04-16-08	0800	1400	1120	04-07-08	080414.01&02	JH
2	04-17-08	0800	1400	1215	04-13-08 B	080416.13&14	JH
3	04-18-08	0810	1415	1203	04-13-08 B	080416.13&14	JH
4	04-19-08	0800	1400	1210	04-16-08A	080418.01&02	JH
5	04-20-08	0900	1500	1207	04-16-08A	080418.01&02	JH
6	04-21-08	0900	1500	1213	04-16-08A	080418.01&02	JH
7	04-22-08			1153			JH

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.806	
Average weight per surviving larvae:	0.806	≥ 0.25 mg/larvae

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

Species: *Pimephales promelas* Date: 04-15-08

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	CONTROL				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 ISM	10	10	10	10	10	10	10	10 ISM	10	10
A = Pan weight (mg) Color identification: red Analyst: MM	14.64	15.33	15.17	14.82	14.88	14.51	14.01	14.46	14.33	13.83	14.54	13.03
B = Pan + Larvae weight (mg) Analyst: MM	23.30	22.05	23.55	23.29	22.80	23.18	21.44	22.33	22.74	20.65	22.94	21.11
Larvae weight (mg) = A – B	8.66	6.72	8.38	8.47	7.92	8.67	7.43	7.87	8.41	6.82	8.40	8.08
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.866	0.672	0.838	0.847	0.792	0.867	0.743	0.787	0.841	0.682	0.840	0.808
Average weight per initial number of larvae (mg)	0.806				0.797				0.793			
Percent reduction from control (%)					1.1%				1.6%			

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

Calculations and data reviewed: JH

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 04-15-08

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	lg 10	10	10	lg 10	10	10	10	lg 10	10	10	10	10
A = Pan weight (mg) Color identification: red Analyst: MM	15.89	14.76	15.38	13.35	15.11	14.22	14.41	14.16	14.02	13.11	14.93	12.86
B = Pan + Larvae weight (mg) Analyst: MM	25.01	23.09	22.47	22.02	22.96	22.31	22.53	23.04	21.69	21.21	22.97	20.62
Larvae weight (mg) = A – B	9.12	8.33	7.09	8.67	7.85	8.09	8.12	8.88	7.67	8.10	8.04	7.76
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.912	0.833	0.709	0.867	0.785	0.809	0.812	0.888	0.767	0.810	0.804	0.776
Average weight per initial number of larvae (mg)	0.830				0.824				0.789			
Percent reduction from control (%)		-3.07.				-2.27.				2.07.		

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

Calculations and data reviewed: JL

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 04-15-08

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 sm	10	10
A = Pan weight (mg) Color identification: MAGENTA Analyst: [illegible]	C 14.27	D 14.01	E 14.75	F 15.41
B = Pan + Larvae weight (mg) Analyst: MM	22.98	21.77	23.53	24.10
Larvae weight (mg) = A – B	8.71	7.70	8.78	8.69
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.871	0.770	0.878	0.869
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.847		-5.1%	

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:

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
April 15-22, 2008

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	4/15/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101
End Date:	4/22/2008	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	0.8660	0.6720	0.8380	0.8470
11.3	0.7920	0.8670	0.7430	0.7870
22.6	0.8410	0.6820	0.8400	0.8080
45.2	0.9120	0.8330	0.7090	0.8670
72.6	0.7850	0.8090	0.8120	0.8880
100	0.7670	0.8100	0.8040	0.7760

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8058	1.0000	0.8058	0.6720	0.8660	11.161	4				0.8099	1.0000
11.3	0.7973	0.9895	0.7973	0.7430	0.8670	6.453	4	0.181	2.410	0.1131	0.8099	1.0000
22.6	0.7928	0.9839	0.7928	0.6820	0.8410	9.512	4	0.277	2.410	0.1131	0.8099	1.0000
45.2	0.8303	1.0304	0.8303	0.7090	0.9120	10.487	4	-0.522	2.410	0.1131	0.8099	1.0000
72.6	0.8235	1.0220	0.8235	0.7850	0.8880	5.424	4	-0.378	2.410	0.1131	0.8099	1.0000
100	0.7893	0.9795	0.7893	0.7670	0.8100	2.656	4	0.352	2.410	0.1131	0.7893	0.9745

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9139455	0.884	-0.9393307	0.42655275
Bartlett's Test indicates equal variances (p = 0.32)	5.84704399	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	0.11311518	0.14038496	0.00114064	0.00440593	0.92965513	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, Intake - UV-treated
April 15-22, 2008

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	4/15/2008	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake
End Date:	4/22/2008	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	0.8660	0.6720	0.8380	0.8470
100	0.8710	0.7700	0.8780	0.8690

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.8058	1.0000	0.8058	0.6720	0.8660	11.161	4				0.8264	1.0000
100	0.8470	1.0512	0.8470	0.7700	0.8780	6.078	4	-0.796	1.943	0.1007	0.8264	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.76526457	0.749	-1.5087627	1.15292051
F-Test indicates equal variances (p = 0.38)	3.05166674	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	0.10067529	0.12494607	0.00340313	0.00536846	0.45626166	1, 6

Linear Interpolation (200 Resamples)

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

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
April 15-22, 2008

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: 3810
Reveiwed by: [signature]

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
							Not for Compliance Assessment, Internal Laboratory QC							
Control	A	10	10	14.64	23.30	8.66	0.866	0.806	11.2	0.866	100.0	0.806	11.2	Not applicable
	B	10	10	15.33	22.05	6.72	0.672			0.672				
	C	10	10	15.17	23.55	8.38	0.838			0.838				
	D	10	10	14.82	23.29	8.47	0.847			0.847				
11.3%	E	10	10	14.88	22.80	7.92	0.792	0.797	6.5	0.792	100.0	0.797	6.5	1.1
	F	10	10	14.51	23.18	8.67	0.867			0.867				
	G	10	10	14.01	21.44	7.43	0.743			0.743				
	H	10	10	14.46	22.33	7.87	0.787			0.787				
22.6%	I	10	10	14.33	22.74	8.41	0.841	0.793	9.5	0.841	100.0	0.793	9.5	1.6
	J	10	10	13.83	20.65	6.82	0.682			0.682				
	K	10	10	14.54	22.94	8.40	0.840			0.840				
	L	10	10	13.03	21.11	8.08	0.808			0.808				
45.2%	M	10	10	15.89	25.01	9.12	0.912	0.830	10.5	0.912	100.0	0.830	10.5	-3.0
	N	10	10	14.76	23.09	8.33	0.833			0.833				
	O	10	10	15.38	22.47	7.09	0.709			0.709				
	P	10	10	13.35	22.02	8.67	0.867			0.867				
72.6%	Q	10	10	15.11	22.96	7.85	0.785	0.824	5.4	0.785	100.0	0.824	5.4	-2.2
	R	10	10	14.22	22.31	8.09	0.809			0.809				
	S	10	10	14.41	22.53	8.12	0.812			0.812				
	T	10	10	14.16	23.04	8.88	0.888			0.888				
100%	U	10	10	14.02	21.69	7.67	0.767	0.789	2.7	0.767	100.0	0.789	2.7	2.0
	V	10	10	13.11	21.21	8.10	0.810			0.810				
	W	10	10	14.93	22.97	8.04	0.804			0.804				
	X	10	10	12.86	20.62	7.76	0.776			0.776				
100% Intake	Y	10	10	14.27	22.98	8.71	0.871	0.847	6.1	0.871	100.0	0.847	6.1	-5.1
	Z	10	10	14.07	21.77	7.70	0.770			0.770				
	AA	10	10	14.75	23.53	8.78	0.878			0.878				
	BB	10	10	15.41	24.10	8.69	0.869			0.869				

Outfall 101:
Dunnett's MSD value: 0.1131
PMSD: 14.0

Intake:
Dunnett's MSD value: 0.1007
PMSD: 12.5

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.

Species: *Pimephales promelas* Date: 04-15-08
Client: TVA / Sequoyah Nuclear Plant – UV-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	JL	MM	MM	UAB	UAB	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.65	7.48	7.66	7.58	7.63	7.40
	DO (mg/L)	7.9	7.5	7.7	7.7	8.0	7.8
	Conductivity (µmhos/cm)	321		334		320	
	Temperature (°C)	24.9	24.5	24.8	24.7	24.9	24.6
11.3%	pH (S.U.)	7.65	7.49	7.65	7.57	7.64	7.39
	DO (mg/L)	7.9	7.4	7.8	7.6	8.0	7.7
	Conductivity (µmhos/cm)	301		316		310	
	Temperature (°C)	25.1	24.7	24.9	24.5	24.9	24.6
22.6%	pH (S.U.)	7.64	7.48	7.63	7.54	7.64	7.37
	DO (mg/L)	8.0	7.4	7.7	7.7	8.0	7.7
	Conductivity (µmhos/cm)	272		290		294	
	Temperature (°C)	25.1	24.7	24.9	24.5	25.0	24.7
45.2%	pH (S.U.)	7.62	7.44	7.60	7.51	7.63	7.33
	DO (mg/L)	8.0	7.4	7.6	7.7	8.0	7.7
	Conductivity (µmhos/cm)	248		260		258	
	Temperature (°C)	25.1	24.6	24.9	24.3	25.0	24.6
72.6%	pH (S.U.)	7.58	7.41	7.57	7.48	7.58	7.32
	DO (mg/L)	8.0	7.4	7.6	7.7	8.0	7.7
	Conductivity (µmhos/cm)	211		219		212	
	Temperature (°C)	25.2	24.6	24.9	24.6	25.0	24.4
100%	pH (S.U.)	7.54	7.39	7.52	7.41	7.54	7.27
	DO (mg/L)	8.0	7.4	7.7	7.4	8.0	7.6
	Conductivity (µmhos/cm)	173		172		169	
	Temperature (°C)	25.2	24.6	24.9	24.6	25.0	24.7
100% Intake	pH (S.U.)	7.53	7.34	7.50	7.44	7.54	7.27
	DO (mg/L)	8.0	7.5	7.7	7.7	8.0	7.6
	Conductivity (µmhos/cm)	166		169		166	
	Temperature (°C)	25.2	24.6	24.9	24.5	25.1	24.6
		Initial	Final	Initial	Final	Initial	Final

	DAY 0 OUTFALL 101	DAY 0 INTAKE		DAY 2 OUTFALL 101	DAY 2 INTAKE
ALKALINITY (mg/L $CaCO_3$)	53	50		51	52
HARDNESS (mg/L $CaCO_3$)	61	67		61	65

Species: *Pimephales promelas* Date: 04·15·08
Client: TVA / Sequoyah Nuclear Plant – UV-treated

		Day							
		3		4		5		6	
	Analyst	MM	LAB	LAB	KEL	KEL	MM	MM	KEL
Concentration	Parameter								
CONTROL	pH (S.U.)	7.54	7.55	7.69	7.30	7.60	7.54	7.56	6.98
	DO (mg/L)	7.8	7.4	7.9	6.9	7.8	7.9	7.6	6.0
	Conductivity (µmhos/cm)	332		311		304	*	~~345~~ 314	
	Temperature (°C)	24.9	24.4	24.9	24.3	24.6	24.7	24.9	24.7
11.3%	pH (S.U.)	7.56	7.53	7.68	7.37	7.60	7.53	7.54	6.96
	DO (mg/L)	7.9	7.5	7.8	6.9	7.8	7.8	7.7	5.6
	Conductivity (µmhos/cm)	314		299		~~299~~	*	~~340~~ 29	
	Temperature (°C)	25.0	24.5	25.0	24.3	24.6	24.6	25.0	24.5
22.6%	pH (S.U.)	7.55	7.52	7.66	7.33	7.61	7.50	7.54	6.96
	DO (mg/L)	8.0	7.5	7.9	7.1	7.7	7.6	7.8	5.6
	Conductivity (µmhos/cm)	299		283		283	*	~~32~~ 24	
	Temperature (°C)	25.0	24.5	25.0	24.2	24.7	24.6	25.0	24.5
45.2%	pH (S.U.)	7.53	7.48	7.63	7.25	7.59	7.47	7.52	6.94
	DO (mg/L)	8.0	7.4	7.9	6.9	7.8	7.5	7.7	5.3
	Conductivity (µmhos/cm)	264		252		253	*	~~28~~ 26	
	Temperature (°C)	25.1	24.6	25.1	24.2	24.7	24.6	25.0	24.6
72.6%	pH (S.U.)	7.49	7.45	7.56	7.24	7.52	7.43	7.49	6.89
	DO (mg/L)	8.1	7.5	7.8	6.8	8.0	7.6	7.8	5.4
	Conductivity (µmhos/cm)	219		212		211	*	~~23~~ 22	
	Temperature (°C)	25.1	24.3	25.1	24.4	24.7	24.6	25.1	24.6
100%	pH (S.U.)	7.46	7.40	7.53	7.16	7.49	7.39	7.46	6.89
	DO (mg/L)	8.1	7.5	8.0	6.7	7.9	7.7	7.8	5.6
	Conductivity (µmhos/cm)	173		171		170	*	~~18~~ 178	
	Temperature (°C)	25.1	24.5	25.1	24.3	24.7	24.5	25.1	24.6
100% Intake	pH (S.U.)	7.44	7.35	7.50	7.17	7.46	7.39	7.45	6.93
	DO (mg/L)	8.1	7.4	7.9	6.7	7.9	7.4	7.9	6.3
	Conductivity (µmhos/cm)	172		170		169	*	~~18~~ 174	
	Temperature (°C)	25.1	24.5	25.1	24.3	24.8	24.7	25.1	24.5
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

DAY 4

	OUTFALL 101	INTAKE
ALKALINITY (mg/L $CaCO_3$)	54	54
HARDNESS (mg/L $CaCO_3$)	69	65

* CELL CONSTANT IN-CORRECT RECALIBRATED.

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
April 15-22, 2008

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: 3810
Reviewed by: [illegible]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.65	7.48	7.66	7.58	7.63	7.40	7.54	7.55	7.69	7.30	7.60	7.54	7.56	6.98
	DO (mg/L)	7.9	7.5	7.7	7.7	8.0	7.8	7.8	7.6	7.9	6.9	7.8	7.9	7.6	6.0
	Conductivity (µmhos/cm)	321		334		320		332		311		304		314	
	Alkalinity (mg/L $CaCO_3$)	61				59				62					
	Hardness (mg/L $CaCO_3$)	86				92				88					
	Temperature (°C)	24.9	24.5	24.8	24.7	24.9	24.6	24.9	24.4	24.9	24.3	24.6	24.7	24.9	24.7
11.3%	pH (SU)	7.65	7.49	7.65	7.57	7.64	7.39	7.56	7.53	7.68	7.37	7.60	7.53	7.54	6.96
	DO (mg/L)	7.9	7.4	7.8	7.6	8.0	7.7	7.9	7.5	7.8	6.9	7.8	7.8	7.7	5.6
	Conductivity (µmhos/cm)	301		316		310		314		299		299		298	
	Temperature (°C)	25.1	24.7	24.9	24.5	24.9	24.6	25.0	24.5	25.0	24.3	24.6	24.6	25.0	24.5
22.6%	pH (SU)	7.64	7.48	7.63	7.54	7.64	7.37	7.55	7.52	7.66	7.33	7.61	7.50	7.54	6.96
	DO (mg/L)	8.0	7.4	7.7	7.7	8.0	7.7	8.0	7.5	7.9	7.1	7.7	7.6	7.8	5.6
	Conductivity (µmhos/cm)	272		290		294		299		283		283		294	
	Temperature (°C)	25.1	24.7	24.9	24.5	25.0	24.7	25.0	24.5	25.0	24.2	24.7	24.6	25.0	24.5
45.2%	pH (SU)	7.62	7.44	7.60	7.51	7.63	7.33	7.53	7.48	7.63	7.25	7.59	7.47	7.52	6.94
	DO (mg/L)	8.0	7.4	7.6	7.7	8.0	7.7	8.0	7.4	7.9	6.9	7.8	7.5	7.7	5.3
	Conductivity (µmhos/cm)	248		260		258		264		252		253		262	
	Temperature (°C)	25.1	24.6	24.9	24.3	25.0	24.6	25.1	24.6	25.1	24.2	24.7	24.6	25.0	24.6
72.6%	pH (SU)	7.58	7.41	7.57	7.48	7.58	7.32	7.49	7.45	7.56	7.24	7.52	7.43	7.49	6.89
	DO (mg/L)	8.0	7.4	7.6	7.7	8.0	7.7	8.1	7.5	7.8	6.8	8.0	7.6	7.8	5.4
	Conductivity (µmhos/cm)	211		219		212		219		212		211		221	
	Temperature (°C)	25.2	24.6	24.9	24.6	25.0	24.4	25.1	24.3	25.1	24.4	24.7	24.6	25.1	24.6
100%	pH (SU)	7.54	7.39	7.52	7.41	7.54	7.27	7.46	7.40	7.53	7.16	7.49	7.39	7.46	6.89
	DO (mg/L)	8.0	7.4	7.7	7.4	8.0	7.6	8.1	7.5	8.0	6.7	7.9	7.7	7.8	5.6
	Conductivity (µmhos/cm)	173		172		169		173		171		170		178	
	Alkalinity (mg/L $CaCO_3$)	53				51				54					
	Hardness (mg/L $CaCO_3$)	61				61				69					
	Temperature (°C)	25.2	24.6	24.9	24.6	25.0	24.7	25.1	24.5	25.1	24.3	24.7	24.5	25.1	24.6
100% Intake	pH (SU)	7.53	7.34	7.50	7.44	7.54	7.27	7.44	7.35	7.50	7.17	7.46	7.39	7.45	6.93
	DO (mg/L)	8.0	7.5	7.7	7.7	8.0	7.6	8.1	7.4	7.9	6.7	7.9	7.4	7.9	6.3
	Conductivity (µmhos/cm)	166		169		166		172		170		169		174	
	Alkalinity (mg/L $CaCO_3$)	50				52				54					
	Hardness (mg/L $CaCO_3$)	67				65				65					
	Temperature (°C)	25.2	24.6	24.9	24.5	25.1	24.6	25.1	24.5	25.1	24.3	24.8	24.7	25.1	24.5

-44.7%

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	UHB	Iodide reagent:	INR290
Date analyzed	04-19-08	Acid reagent:	INR270

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS579	INSS579

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%)
INSS579	0.50	0.464	92.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
080419.02	MONROE WWTP	clear, pale tan	S < 0.0000471	
↓	Duplicate		D < 0.0000184	UB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00812
080419.03	Allen SS	clear, no color	0.00560
080419.01	Foxwood Hills	clear, no color	<0.0000126
080419.04	Riverbend SS	clear, no color	0.000130
080419.05	Guilford Mills-eff	clear, yellow	<0.0000791
080419.06	↓ secondary clar.	opaque, brown	<0.0000141
080419.08	Goldsboro (002) wetlands	clear w/ particles, pale tan	<0.0000505
080419.07	↓ eff (001)	clear w/ particles, pale tan	0.0000677
080418.02	SQN-intake	slightly cloudy w/ part., pale tan	<0.0216
080418.01	↓ (101) ~~FOX #2~~	slightly cloudy w/ part., pale tan	<0.00319

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
	~~0.50~~		UB

Reviewed by: [signature]
Date reviewed: 04-19-08

ETS
Environmental Testing Solutions, inc.

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

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

Analyst	VAB
Date analyzed	04-19-08

Iodide reagent:	
Acid reagent:	VB

Calibration:

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

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%)
INS5579	0.50	0.464	92.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
080419.09	Henderson WWTP	clear, no color	S <0.00411	
↓	Duplicate		D <0.00197	VB

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		VB
080419.10	Henderson Ians	cloudy w/particles, pale green	<0.000849
080419.11	↓ Kennametal	cloudy w/particles, pale white	<0.000352
080419.12	↓ Walmart	opaque w/part., brown	<0.000303
			VB

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%)
INS5579	0.50	0.502	100.4%

Reviewed by	JH
Date reviewed	04-19-08

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	JH	Iodide reagent:	INR 290
Date analyzed	04-15-08	Acid reagent:	INR 270

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS579	INSS579

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 579	0.50	0.525	105.0%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
080415.01	FOXWOOD HILLS SD	NO COLOR, CLEAR	S <0.000606	
↓	Duplicate		D <0.000602	JH

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.000845
080415.03	HENDERSON WWTP	NO COLOR, CLEAR	<0.000172
080415.02	MONROE WWTP	LIGHT TAN, CLEAR, PARTICLES	<0.0000175
080414.01	SQN 101	PALE TAN, CLEAR PARTICLES	<0.000246
080414.02	SQN INTAKE	PALE TAN, CLEAR, PARTICLES	<0.000323
			JH

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 579	0.50	0.530	106.0%

Reviewed by JH
Date reviewed 04-16-08

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	KEP	Iodide reagent:	INL 290
Date analyzed	04-17-08	Acid reagent:	INL 270

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5579	INS5579

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%)
INS5579	0.50	0.531	106.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
080417.01	Foxwood	pale tan clear	S <0.00754	
↓	Duplicate		D <0.00516	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00923
080417.03	Henderson WWTP	pale tan, Clear	<0.0013
080417.02	Monroe WWTP	tan, Clear	<0.000509
080416.13	TVA-SQN-101	pale tan, Clear	0.00138
080416.14	↓ INT	pale tan, Clear, particles	0.0000265

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%)
INS5579	0.50	0.507	101.4%

Reviewed by
Date reviewed 04-17-08

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	UAB	Time initiated	1500
Date analyzed	04-12-08	Time completed	1600

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
6.0	INR 271	INS5569	0.1	12.3	12.2	0.0205	10.2

Balk correction 0.0 − 0.1 = 0.1 ML

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%)
INS5535	100	100	12.3	21.8	9.5	10.2	97	97.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
04-07-08	MHS H_2O	100	21.8	27.6	5.8	10.2	S 59	
↓	Duplicate (B)	100	27.6	33.3	5.7	10.2	D 58	1.7%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5535	50	100	27.6	38.2	10.6	10.2	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%)
58	52	104%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
04-07-08	SSW H_2O	100	38.2	41.3	3.1	10.2	32
04-04-08B	MHS UV #7	↓	0.0	5.8	5.8	↓	59
080409.10	TVA WCF	↓	5.8	14.6	8.8	↓	90
080409.11	↓ WCF UP	↓	14.6	19.8	5.2	↓	53
04-08-08	SALTSW	↓	19.8	29.1	9.3	↓	95
04-09-08	SaltSW	↓	29.1	38.3	9.2	↓	94
080405.05	Hercules 1	25	38.3	41.7	3.4	(4) ↓	140
080408.01	↓ 2	↓	41.7	44.9	3.2	↓	130
080410.03	↓ 3	↓	0.0	3.3	3.3	↓	140

Reviewed by: [illegible] Date reviewed: 04-12-08

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	LAB	Time initiated	1609
Date analyzed	04-12-08	Time completed	1650

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
							LB

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%)
INS5535	100	100	3.3	13.0	9.7	10.2	99	99%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
47718	EESH 040808	100	13.0	14.1	1.1	10.2	S 11	
↓	Duplicate (B)	100	14.1	15.2	1.1	10.2	D 11	LB

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)
INS5535	50	100	14.1	20.0	5.9	10.2	60

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
11	49	98%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
47719	EESH 040809	100	20.0	21.1	1.1	10.2	11
47720	↓ " 040810	100	21.1	21.5	0.4		4.1
080408.05	Cape Hatt 1	25	21.5	35.4	13.9	(4)	570
080410.02	2		35.4	50.0 0.0-0.2	14.8		600
080412.05	↓ 3		0.2	14.4	14.2		580
080408.04	Camp LoJ 1		14.4	18.1	3.7		150
080410.01	2		18.1	21.1	3.0		120
080412.06	↓ 3		21.1	23.8	2.7		110
							LB

Reviewed by: [signature] Date reviewed: 04-12-08

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	UAB / KEN
Date analyzed	04-19-08

Titrate samples to pH = 4.50 S.U.

Time initiated	1606
Time completed	1740

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
4.7	INR271	INSS569	0.0	12.0	12.0	0.0208	10.4

Blank correction - 0.0 - 0.0

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS535	100	100	12.0	21.3	9.3	10.4	97	97.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
04-16-08A	MHS H2O	100	21.3	27.4	6.1	10.4	S 63	
↓	Duplicate (B)	100	27.4	33.6	6.2	10.4	D 64	1.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS535	~~100~~ 50	100	27.4	38.4	11	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%)
64	46	92.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
04-16-08B	MHS H2O	100	38.4	44.2	5.8	10.4	60
04-13-08A	↓		~~44.2~~ 60	5.8	5.8		60
04-13-08B			5.8	11.8	6.0		~~63~~ 62
04-18-08	SSW H2O	* 16.8	~~11.8~~ 17.8	19.8	~~2.0~~	~~4.0~~ 3.0	31 ~~41~~ ~~42~~
04-18-08	MHS H2O	* 5.8	~~11.8~~	11.4	5.6		58
04-07-08	MHS W 1	* 39.6	~~19.0~~	~~24.2~~ 45.5	~~4.7~~ 5.9		~~96~~ 61
04-13-08 B	2	* 0.0	~~24.5~~	~~27.1~~ 5.9	~~46~~ 6.7		~~94~~ 59
04-16-08A	↓ 3	↓	33.6	39.6	6.0		62
06-15-03	Henderson 1	50	11.4	17.7	6.3	(2) ↓	130

* RE ANALYZED & CONFIRMED

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	KEN
Date analyzed	04-19-08

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%)
IN 55535	100	100	17.7	27.1	9.4	10.4	98	98.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
080417.03	Henderson 2	50	27.1	33.5	6.4	(2) 10.4	S 130	
↓	Duplicate (B)	↓	33.5	39.6	6.1	↓ ↓	D 130	—

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)
IN 55535	100	50	33.5	44.2	10.7	(2)	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%)
130	90	90.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
080419.13	Henderson 3	50	0.0	5.5	5.5	(2) 10.4	110
080415.02	Monroe 1	↓	5.7	10.5	4.8	↓	50
080417.02	↓ 2		10.5	14.7	4.2		44
080419.02	↓ 3		14.7	19.5	4.8		50
080415.01	Foxwood 1		19.5	23.2	3.7		38
080417.01	↓ 2		23.2	27.3	4.1		43
080419.01	↓ 3	↓	27.3	32.9	5.6		58
080416.07	TVA-COF-001	50	32.9	36.0	3.1	(2)	64
080416.08	↓ UP	↓	36.1	39.1	3.0	↓	62

Reviewed by: [signature] Date reviewed: 04-20-08

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	KEN	Time initiated	
Date analyzed	04.19.08	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%)
INS5535	100	100	39.3	48.7	9.4	10.4	98	98.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	0.0 Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
47824	EES # 040824	100	39.3	1.5	1.5	10.4	S 16	
↓	Duplicate (B)	↓	1.5	2.9	1.4	↓	D 15	6.4%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5535	60	100	1.5	7.6	6.1	10.4	63

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
15	48	96.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
47825	EES # 040825	100	7.6	9.0	1.4	10.4	15
47826	↓ # 040826	↓	9.0	11.2	2.2	↓	23
080414.01	TVASQN101 1		11.2	16.3	5.1		53
080416.13	↓ 2		16.3	21.5	5.2		54
080418.01	↓ 3		21.5	26.6	5.1		53
080414.02	TVA SQN INT 1		26.6	31.6	5.0		52
080416.14	↓ 2		31.6	36.8	5.2		54
080418.02	↓ 3		36.8	42.1	5.3		55
080414.01	TVASQN101UV 1	↓	42.1	47.2	5.1	↓	53

Reviewed by: [illegible] Date reviewed: 04.20.08

ETS Environmental Testing Solutions, Inc.

Alkalinity
(SM 2320 B)

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

Analyst	KEN
Date analyzed	04-19-08

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%)
INS5535	100	100	0.0	9.3	9.3	10.4	97	97.0%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
080416.13	TVA-SQN10NW2	100	9.3	14.2	4.9	10.4	S 51	
↓	Duplicate (B)	↓	14.2	19.3	5.1	↓	D 53	3.8%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5535	50	100	14.2	24.1	9.9	10.4	100

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
53	47	94.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
080418.01	TVA-SQN10W3	100	24.1	29.3	5.2	10.4	54
080414.02	TVA SQN INT W 1	↓	29.3	34.1	4.0	↓	50
080416.14	2	↓	34.1	39.1	5.0	↓	52
080418.02	↓ 3	↓	39.1	44.3	5.2	↓	54

Reviewed by: [signature] Date reviewed: 04-20-08

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	LAB	Time initiated	1356
Date analyzed	04-12-08	Time completed	1433

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
INR288	INS5513	0.0	9.8	9.8	0.0204	20.4

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5513 5660 LB	40	50	9.8	11.8	2.0	20.4	41	102.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
04-07-08	MHS H_2O	50	11.8	16.3	4.5	20.4	S 92	
↓	Duplicate (B)	50	16.3	20.8	4.5	20.4	D 92	LB

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)
INS5513 5660 LB	40	50	16.3	22.9	6.6	20.4	140

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%)
92	48	120%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank (should be = 0 mg $CaCO_3$/L)	50	0.0	0.0	0.0	20.4	ND
04-07-08	SSW H_2O		22.9	25.0	2.1		43
~~04-08~~ 040408B	MHS UV #7		25.0	29.6	4.6		94
080409.10	TVA WCF		29.6	38.7	9.1		190 (186)
080409.11	↓ WCF UP		38.7	41.8	3.1		63

LAB

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

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	KEH	Time initiated	12:15
Date analyzed	04-19-08	Time completed	1335

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
INR800	INSS513	0.0	9.8	9.8	~~0.0205~~ 0.0204	20.4

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS526	40	50	9.8	11.9	2.1	20.4	43	107.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
04-16-08A	mits H2O	50	11.9	16.3	4.4	20.4	S 90	
↓	Duplicate (B)	↓	16.3	20.6	4.3	↓	D 88	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)
INSS526	40	50	16.3	22.8	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%)
88	42	105.0%

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	20.4	ND
04-16-08B	mits H2O		22.8	27.4	4.6		94
04-18-08	↓		27.4	31.9	4.5		92
04-18-08	SSW H2O		31.9	34.1	2.2		45
080415.03	Henderson 1		34.1	42.8	8.7		180
080417.03	↓ 2	25	42.8	47.1	4.3	(2)	180
080419.13	↓ 3		0.0	4.4	4.4		180
080415.02	Monroe 1		4.4	8.0	3.6		150
080417.02	↓ 2		8.0	12.2	4.2		170
080419.02	↓ 3		12.2	17.2	5.0		200

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	MLW	Time initiated	
Date analyzed	041908	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%)
INS5566	40	50	17.2	19.2	2.0	20.4	41	102.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
080414.01	TVA SQN 101 1	25	19.2	20.8	1.6	(2) 20.4	S 65	
↓	Duplicate (B) ↓	↓	20.8	22.4	1.6	↓	D 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)
INS5566	80	25	20.8	24.5	3.7	(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%

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)						
080416.13	TVA SQN 101 2	50	24.5	27.5	3.0	20.4	61
080418.01	↓ 3	↓	27.5	30.7	3.2	↓	65
080414.02	TVA SQN INT 1		30.7	33.5	2.8		57
080416.14	↓ 2		33.5	36.7	3.2		65
080418.02	↓ 3		36.7	39.8	3.1		63
080415.01	Foxwood 1		39.8	41.3	1.5		31
080417.01	↓ 2		41.3	43.0	1.7		35
080419.01	↓ 3	↓	43.0	45.2	2.2		45
080416.07	TVA COF 001	25	45.2	47.4	2.2	(2) ↓	90

Reviewed by: [illegible] Date reviewed: [illegible]

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	KEN	Time initiated	
Date analyzed	04-19-08	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%)
INSS-526	40	50	0.0	2.1	2.1	20.4	43	107.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100
080416.08	TVA COF-UP	25	~~12.3~~ 9.3	4.4	2.1	(2) 20.4	S 87	
↓	Duplicate (B)	↓	4.4	6.5	2.1	↓ ↓	D 87	n

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-526	80	25	4.4	8.4	4.0	(2) 20.4	160

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%)
87	73	91.2%

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)				3.0		n
080414.01	TVA-SQN.NT.W 1	50	8.4	11.4	~~2.0~~	20.4	~~44~~ 61
080416.13	↓ 2	↓	11.4	14.4	3.0	↓	61
080418.01	↓ 3	↓	14.4	17.8	3.4	↓	69
080414.02	TVA SQN.NT W 1	↓	17.8	21.1	3.3	↓	67
080416.14	↓ 2	↓	21.1	24.3	3.2	↓	65
080418.02	↓ 3	↓	24.3	27.5	3.2	↓	65
04-07-08	MHS VV 1	↓	27.5	31.7	4.2	↓	86
04-13-08 B	↓ 2	↓	31.7	36.2	4.5	↓	92
04-16-08 A	↓ 3	↓	36.2	40.5	4.3	↓	88

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst		Time initiated	
Date analyzed		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%)
	40	50						

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
~~04-13-08 A~~	~~MILS H2O~~						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 hardness (A) (mg $CaCO_3$/L)

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%)

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)						
04-13-08A	MILS H2O	50	40.5	45.0	4.5	20.4	92
04-13-08B	↓	↓	45.2	49.8	4.0	↓	94

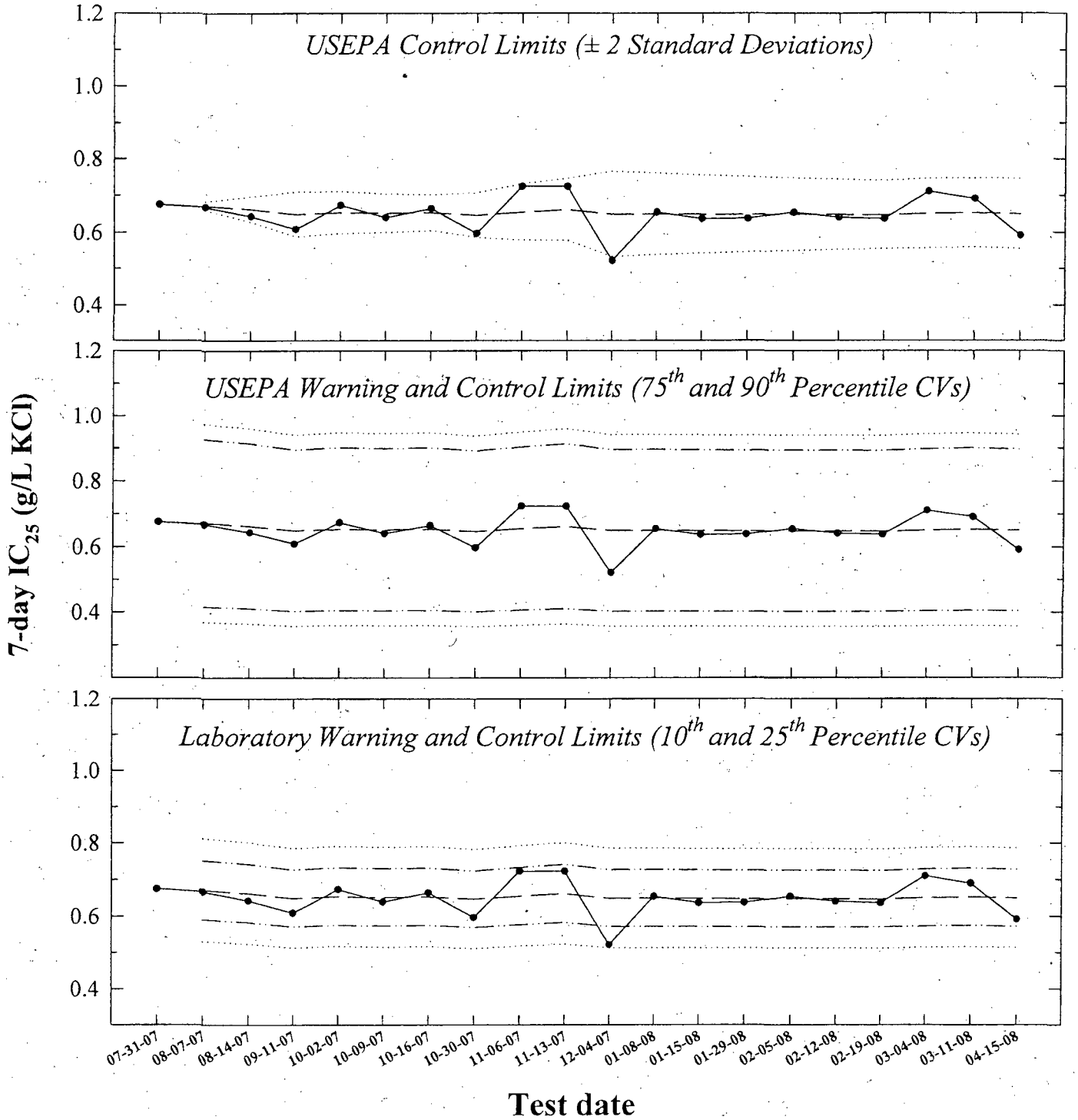
Sequoyah Nuclear Plant Biomonitoring
April 15 – 22, 2008

Appendix D

Reference Toxicant Test and
Control Chart

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

est 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	07-31-07	0.68																	
2	08-07-07	0.67	0.67	0.01	0.66	0.68	0.08	0.59	0.75	0.14	0.53	0.81	0.26	0.42	0.93	0.30	0.37	0.97	0.01
3	08-14-07	0.64	0.66	0.02	0.63	0.70	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.96	0.03
4	09-11-07	0.61	0.65	0.03	0.59	0.71	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.90	0.29	0.36	0.94	0.05
5	10-02-07	0.67	0.65	0.03	0.60	0.71	0.08	0.58	0.73	0.14	0.52	0.79	0.25	0.41	0.90	0.29	0.36	0.95	0.04
6	10-09-07	0.64	0.65	0.03	0.60	0.70	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.04
7	10-16-07	0.66	0.65	0.02	0.60	0.70	0.08	0.57	0.73	0.14	0.52	0.79	0.25	0.41	0.90	0.29	0.36	0.95	0.04
8	10-30-07	0.60	0.65	0.03	0.59	0.71	0.08	0.57	0.72	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.05
9	11-06-07	0.72	0.65	0.04	0.58	0.73	0.08	0.58	0.73	0.14	0.52	0.79	0.25	0.41	0.90	0.29	0.36	0.95	0.06
10	11-13-07	0.72	0.66	0.04	0.58	0.75	0.08	0.58	0.74	0.14	0.52	0.80	0.25	0.41	0.91	0.30	0.36	0.96	0.06
11	12-04-07	0.52	0.65	0.06	0.53	0.77	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.09
12	01-08-08	0.65	0.65	0.06	0.54	0.76	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.09
13	01-15-08	0.64	0.65	0.05	0.54	0.75	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.08
14	01-29-08	0.64	0.65	0.05	0.55	0.75	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.08
15	02-05-08	0.65	0.65	0.05	0.55	0.75	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.08
16	02-12-08	0.64	0.65	0.05	0.55	0.74	0.08	0.57	0.73	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.07
17	02-19-08	0.64	0.65	0.05	0.55	0.74	0.08	0.57	0.72	0.14	0.51	0.78	0.25	0.40	0.89	0.29	0.36	0.94	0.07
18	03-04-08	0.71	0.65	0.05	0.56	0.75	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.07
19	03-11-08	0.69	0.65	0.05	0.56	0.75	0.08	0.57	0.73	0.14	0.52	0.79	0.25	0.40	0.90	0.29	0.36	0.95	0.07
20	04-15-08	0.59	0.65	0.05	0.55	0.74	0.08	0.57	0.73	0.14	0.51	0.79	0.25	0.40	0.90	0.29	0.36	0.94	0.07

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	07-31-07	100	0.686		7.9		0.08	11.0	
2	08-07-07	100	0.854	0.770	11.5	9.7	0.13	15.7	13.4
3	08-14-07	97.5	0.900	0.813	13.1	10.8	0.13	14.4	13.7
4	09-11-07	100	0.831	0.818	6.3	9.7	0.14	17.4	14.6
5	10-02-07	100	0.918	0.838	4.9	8.7	0.17	18.1	15.3
6	10-09-07	100	0.772	0.827	7.9	8.6	0.08	10.2	14.5
7	10-16-07	100	0.662	0.803	13.6	9.3	0.08	12.8	14.2
8	10-30-07	100	0.771	0.799	12.0	9.6	0.16	20.1	15.0
9	11-06-07	100	0.624	0.780	6.4	9.3	0.09	14.7	14.9
10	11-13-07	100	0.603	0.762	14.2	9.8	0.10	16.8	15.1
11	12-04-07	100	0.756	0.761	7.9	9.6	0.11	14.5	15.1
12	01-08-08	100	0.821	0.766	2.7	9.0	0.03	3.4	14.1
13	01-15-08	100	0.842	0.772	10.5	9.1	0.14	17.0	14.3
14	01-29-08	97.5	0.728	0.769	5.4	8.9	0.07	9.0	13.9
15	02-05-08	100	0.818	0.772	7.2	8.8	0.07	9.1	13.6
16	02-12-08	100	0.709	0.768	2.4	8.4	0.05	6.8	13.2
17	02-19-08	100	0.833	0.772	6.1	8.2	0.13	15.5	13.3
18	03-04-08	100	0.731	0.770	6.0	8.1	0.07	9.0	13.1
19	03-11-08	97.5	0.695	0.766	5.1	8.0	0.07	10.5	12.9
20	04-15-08	100	0.999	0.778	9.0	8.0	0.11	11.1	12.8

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)

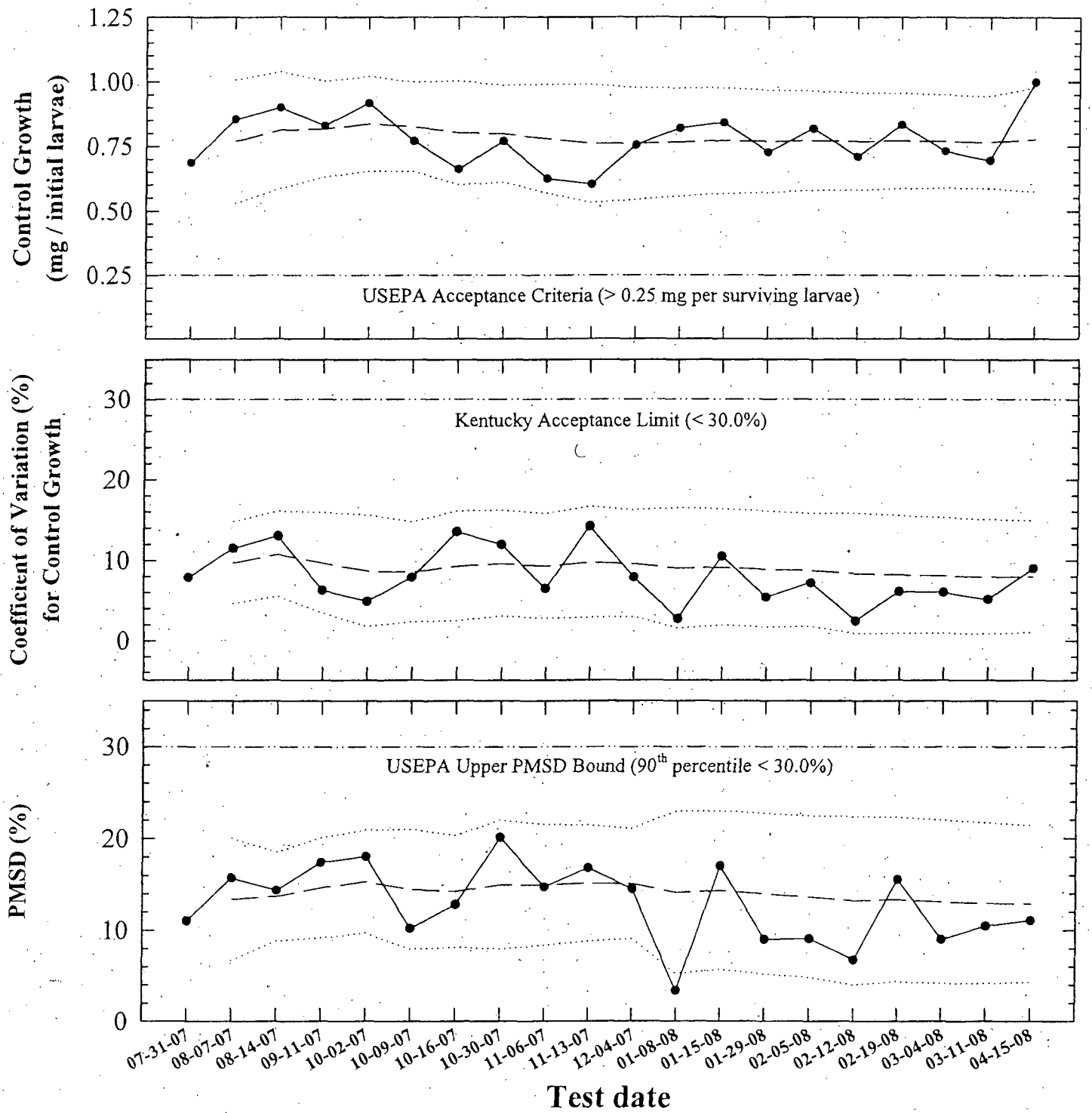
USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

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.

Organisms obtained from Aquatox, Inc.

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)

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

PpKClCR Test Number: 150

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM 349					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized 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 HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	04-14-08 1600	Incubator number and shelf location:	3D
Organism source:	ATOX BATCH Pp 04-14-08	*Artemia* lot number:	B602041V
Transfer bowl information:	pH = 7.89 SU Temperature = 24.2 °C	Total drying time:	24 HOURS
		Date / Time in: 04-22-08	1200
Average transfer volume:	8.6 mL	Date / Time out: 04-23-08	1200
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Analyst
0	04-15-08	—	1230	1202	04-07-08	JL
1	04-16-08	0800	1400	1132	04-07-08	JL
2	04-17-08	0800	1400	1103	04-13-08 B	JL
3	04-18-08	0810	1415	1105	04-13-08 B	JL
4	04-19-08	0800	1400	1107	04-16-08 A	JL
5	04-20-08	0900	1500	1105	04-16-08 A	JL
6	04-21-08	0900	1500	1104	04-16-08 A	JL
7	04-22-08			1112		JL

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per initial larvae:	0.999	
Average weight per surviving larvae:	0.999	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC_{50}	789.9
NOEC	450
LOEC	600
ChV	519.6
IC_{25}	591.1

Species: *Pimephales promelas* PpKClCR Test Number: 150

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	9 id
2	10	10	10	10	10	10	10	10	9 id	10	10	9
3	10	10	10	10	10	10	10	10	9	10	10	9
4	10	10	10	10	10	10	10	10	9	10	10	9
5	10	10	10	10	10	10	10	10	9	10	9 id	8 id
6	10	10	10	10	10	10	10	10	9	10	9	8
7	10	10	10	10	10	10 ISM	10 ISM	10	8 id	10 ISM	9 ISM	8
A = Pan weight (mg) Tray color code:: dk blue Analyst: MM	14.35	12.00	12.14	14.14	14.24	14.13	14.28	14.33	14.08	14.35	14.70	14.41
B = Pan + Larvae weight (mg) Analyst: MM	23.83	22.43	21.17	25.16	24.32	22.62	22.89	23.74	21.30	22.36	21.87	21.56
C = Larvae weight (mg) = A – B	9.48	10.43	9.03	11.02	10.08	8.49	8.61	9.41	7.22	8.01	7.17	7.15
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.948	1.043	0.903	1.102	1.008	0.849	0.861	0.941	0.722	0.801	0.717	0.715
Average weight per initial number of larvae (mg)	0.999				0.915				0.739			
Percent reduction from control (%)					8.4%				26.1%			

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: JH

Comments:

Species: *Pimephales promelas* PpKClCR Test Number: 150

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	9 1d	9 1d	7 3d	8 2d	~~4 4d~~ 8 2d	~~5 5d~~ 9 1d	~~5 5d~~ 9 1d	~~5 5d~~ 7 3d	4 1d	5 5d	5 5d	5 5d
2	8 1d	9	7	8	7 1d	8 1d	8 1d	6 1d	3 1d	4 1d	3 2d	2 3d
3	7 1d	9	7	8	7	8	8	6	3	4	3	1 1d
4	5 2d	7 2d	6 1d	7 1d	7	7 1d	8	6	2 1d	2 2d	3	1
5	4 1d	6 1d	6	7	5 2d	4 3d	7 1d	5 1d	2	2	1 2d	0 1d
6	4	6	5 1d	7	4 1d	4 1d	7	4 1d	1 1d	1 1d	0 1d	0
7	4 1lg	6	5	7	4	4 1lg	6 1d SM	4 SM	1 SM	0 1d	0	0
A = Pan weight (mg) Tray color code:: dk. blue Analyst: MM	14.37	14.95	14.11	14.78	14.61	14.50	14.77	13.96	14.40	12.75	15.44	13.89
B = Pan + Larvae weight (mg) Analyst: MM	18.47	19.31	18.21	20.14	17.49	18.16	17.09	15.99	15.01	—	—	—
C = Larvae weight (mg) = A – B	4.10	4.36	~~4.11d~~ 4.10	5.36	2.88	3.66	2.32	2.03	0.61	—	—	—
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.410	0.436	~~0.411d~~ 0.410	0.536	0.288	0.366	0.232	0.203	0.061	0	0	0
Average weight per initial number of larvae (mg)	0.448				0.272				0.015			
Percent reduction from control (%)			~~55.1%d~~ 55.2%				72.7%				98.5%	

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

Calculations and data reviewed: 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: PpKClCR #150
Test dates: April 15-22, 2008
Reveiwed by: [signature]

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14.35	23.83	9.48	0.948	0.999	9.0	0.948	100.0	0.999	9.0	Not applicable
	B	10	10	12.00	22.43	10.43	1.043			1.043				
	C	10	10	12.14	21.17	9.03	0.903			0.903				
	D	10	10	14.14	25.16	11.02	1.102			1.102				
450	E	10	10	14.24	24.32	10.08	1.008	0.915	8.1	1.008	100.0	0.915	8.1	8.4
	F	10	10	14.13	22.62	8.49	0.849			0.849				
	G	10	10	14.28	22.89	8.61	0.861			0.861				
	H	10	10	14.33	23.74	9.41	0.941			0.941				
600	I	10	8	14.08	21.30	7.22	0.903	0.848	6.8	0.722	87.5	0.739	5.6	26.1
	J	10	10	14.35	22.36	8.01	0.801			0.801				
	K	10	9	14.70	21.87	7.17	0.797			0.717				
	L	10	8	14.41	21.56	7.15	0.894			0.715				
750	M	10	4	14.37	18.47	4.10	1.025	0.834	15.9	0.410	55.0	0.448	13.4	55.2
	N	10	6	14.95	19.31	4.36	0.727			0.436				
	O	10	5	14.11	18.21	4.10	0.820			0.410				
	P	10	7	14.78	20.14	5.36	0.766			0.536				
900	Q	10	4	14.61	17.49	2.88	0.720	0.632	36.9	0.288	45.0	0.272	26.4	72.7
	R	10	4	14.50	18.16	3.66	0.915			0.366				
	S	10	6	14.77	17.09	2.32	0.387			0.232				
	T	10	4	13.96	15.99	2.03	0.508			0.203				
1050	U	10	1	14.40	15.01	0.61	0.610	0.610	0.0	0.061	2.5	0.015	200.0	98.5
	V	10	0	0.00	0.00	0.00	0.000			0.000				
	W	10	0	0.00	0.00	0.00	0.000			0.000				
	X	10	0	0.00	0.00	0.00	0.000			0.000				

Dunnett's MSD value: 0.1104
PMSD: 11.1

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
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:	4/15/2008	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	4/22/2008	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	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	0.8000	1.0000	0.9000	0.8000
750	0.4000	0.6000	0.5000	0.7000
900	0.4000	0.4000	0.6000	0.4000
1050	0.1000	0.0000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
450	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
600	0.8750	0.8750	1.2188	1.1071	1.4120	11.906	4	12.00	10.00	5	40
*750	0.5500	0.5500	0.8368	0.6847	0.9912	15.736	4	10.00	10.00	18	40
*900	0.4500	0.4500	0.7351	0.6847	0.8861	13.697	4	10.00	10.00	22	40
*1050	0.0250	0.0250	0.1995	0.1588	0.3218	40.840	4	10.00	10.00	39	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.90808922	0.884	0.72032328	0.47949075
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.820393	
Treatments vs D-Control				

Trimmed Spearman-Karber

Trim Level	EC50	95% CL	
0.0%			
5.0%	794.25	752.88	837.89
10.0%	800.96	757.45	846.96
20.0%	807.84	755.68	863.60
Auto-2.5%	789.93	750.11	831.86

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	4/15/2008	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	4/22/2008	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	0.9480	1.0430	0.9030	1.1020
450	1.0080	0.8490	0.8610	0.9410
600	0.7220	0.8010	0.7170	0.7150
750	0.4100	0.4360	0.4100	0.5360
900	0.2880	0.3660	0.2320	0.2030
1050	0.0610	0.0000	0.0000	0.0000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9990	1.0000	0.9990	0.9030	1.1020	9.020	4				0.9990	1.0000
450	0.9148	0.9157	0.9148	0.8490	1.0080	8.131	4	1.664	2.180	0.1104	0.9148	0.9157
*600	0.7388	0.7395	0.7388	0.7150	0.8010	5.632	4	5.140	2.180	0.1104	0.7388	0.7395
750	0.4480	0.4484	0.4480	0.4100	0.5360	13.378	4				0.4480	0.4484
900	0.2723	0.2725	0.2723	0.2030	0.3660	26.362	4				0.2723	0.2725
1050	0.0153	0.0153	0.0153	0.0000	0.0610	200.000	4				0.0153	0.0153

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94532621	0.805	0.30619595	-1.1083028
Bartlett's Test indicates equal variances (p = 0.49)	1.43829	9.2103405		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	600	519.615242		0.11038579	0.11049628	0.07053608	0.00512794	0.00183321	2, 9
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	266.80	114.92	37.99	612.08	0.3314
IC10	463.34	76.70	118.13	549.57	-1.2730
IC15	505.91	45.10	290.66	594.58	-1.4288
IC20	548.48	33.85	428.48	632.66	-0.5955
IC25	591.05	27.09	488.26	643.12	-0.7030
IC40	671.89	15.56	621.78	722.15	0.0988
IC50	723.43	15.70	680.20	777.17	0.5577

* indicates IC estimate less than the lowest concentration

Species: *Pimephales promelas* PpKClCR Test Number: 150

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	H	MM	MM	LAB	LAB	MM
Concentration	Parameter						
CONTROL	pH (S.U.)	7.92	7.46	7.49	7.62	7.70	7.66
	DO (mg/L)	8.0	7.7	7.6	7.8	7.8	8.0
	Conductivity (µmhos/cm)	322		343		322	
	Alkalinity (mg $CaCO_3$/L)	59				62	
	Hardness (mg $CaCO_3$/L)	92				94	
	Temperature (°C)	24.8	24.3	24.7	24.2	24.6	24.5
450 mg KCl/L	pH (S.U.)	7.91	7.54	7.63	7.64	7.79	7.68
	DO (mg/L)	8.0	7.5	7.7	7.8	8.0	7.8
	Conductivity (µmhos/cm)	1100		1140		1100	
	Temperature (°C)	24.7	24.5	24.6	24.2	24.6	24.3
600 mg KCl/L	pH (S.U.)	7.91	7.58	7.65	7.65	7.80	7.67
	DO (mg/L)	8.0	7.6	7.7	7.8	8.0	7.8
	Conductivity (µmhos/cm)	1340		1390		1370	
	Temperature (°C)	24.6	24.5	24.6	24.4	24.6	24.3
750 mg KCl/L	pH (S.U.)	7.91	7.59	7.67	7.66	7.81	7.67
	DO (mg/L)	8.0	7.6	7.8	7.8	8.0	7.7
	Conductivity (µmhos/cm)	1600		1640		1630	
	Temperature (°C)	24.6	24.5	24.6	24.5	24.5	24.3
900 mg KCl/L	pH (S.U.)	7.91	7.58	7.68	7.66	7.82	7.69
	DO (mg/L)	8.0	7.6	7.7	7.8	8.0	7.6
	Conductivity (µmhos/cm)	1810		1910		1880	
	Temperature (°C)	24.8	24.4	24.6	24.3	24.5	24.3
1050 mg KCl/L	pH (S.U.)	7.92	7.62	7.68	7.67	7.83	7.73
	DO (mg/L)	8.0	7.6	7.7	8.0	8.2	7.7
	Conductivity (µmhos/cm)	2050		2160		2150	
	Temperature (°C)	24.7	24.4	24.6	24.3	24.6	24.4
STOCK	Conductivity (µmhos/cm)	73000		—		—	
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

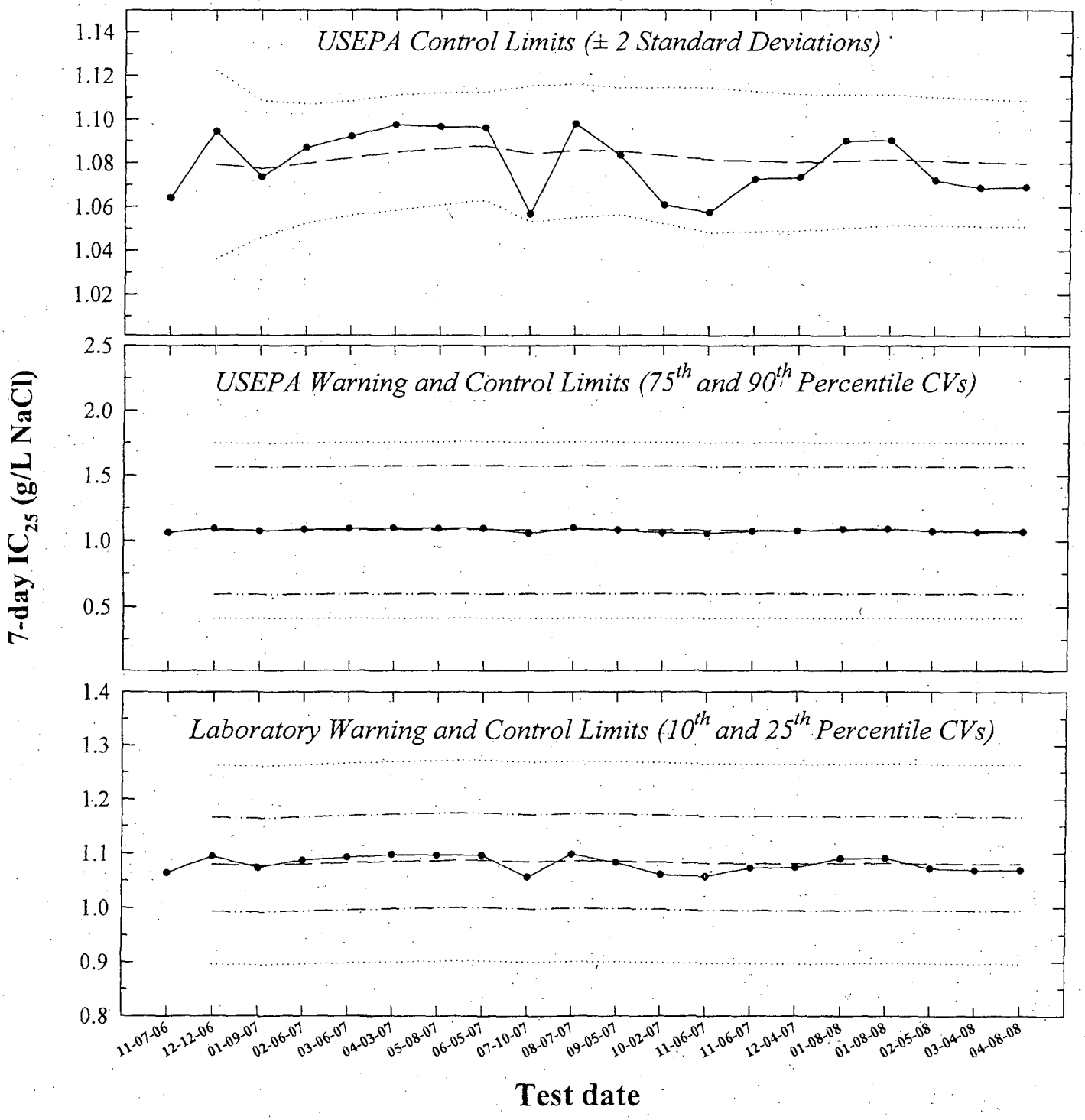
PpKClCR Test Number: 150

		Day							
		3		4		5		6	
	Analyst	MM	LAB	LAB	KLK	KLL	MM	MM	KLL
Concentration	Parameter								
CONTROL	pH (S.U.)	7.86	7.61	7.83	7.59	7.97	7.62	7.69	7.37
	DO (mg/L)	7.9	7.5	7.8	6.8	7.6	7.7	7.5	6.4
	Conductivity (µmhos/cm)	320		310		303	*	360 (344)	
	Alkalinity (mg $CaCO_3$/L)			63					
	Hardness (mg $CaCO_3$/L)			90					
	Temperature (°C)	24.8	24.7	24.8	24.3	24.7	24.4	24.9	24.2
450 mg KCl/L	pH (S.U.)	7.87	7.60	7.88	7.58	7.96	7.65	7.75	7.30
	DO (mg/L)	7.9	7.1	7.8	6.7	7.6	7.5	7.5	6.2
	Conductivity (µmhos/cm)	1130		1100		1050	*	1240 (1130)	
	Temperature (°C)	24.9	24.5	24.7	24.2	24.6	24.3	25.0	24.6
600 mg KCl/L	pH (S.U.)	7.88	7.69	7.89	7.54	7.95	7.63	7.76	7.29
	DO (mg/L)	8.0	7.3	7.8	6.4	7.6	7.5	7.6	5.8
	Conductivity (µmhos/cm)	1400 (1400)		1370		1340	*	1520 (1400)	
	Temperature (°C)	24.9	24.4	24.7	24.2	24.6	24.4	25.0	24.6
750 mg KCl/L	pH (S.U.)	7.88	7.67	7.90	7.56	7.96	7.65	7.77	7.29
	DO (mg/L)	8.1	7.4	7.8	6.5	7.6	7.5	7.6	5.9
	Conductivity (µmhos/cm)	1650		1610		1600	*	1800 (1650)	
	Temperature (°C)	25.0	24.6	24.7	24.2	24.7	24.2	24.9	24.7
900 mg KCl/L	pH (S.U.)	7.89	7.66	7.90	7.52	7.96	7.64	7.77	7.29
	DO (mg/L)	8.0	7.3	7.8	6.5	7.6	7.6	7.6	5.7
	Conductivity (µmhos/cm)	1920		1860		1830	*	2100 (1920)	
	Temperature (°C)	24.8	24.4	24.8	24.5	24.7	24.2	24.9	24.3
1050 mg KCl/L	pH (S.U.)	7.89	7.75	7.92	7.62	7.98	7.67	7.77	7.35
	DO (mg/L)	8.1	7.6	7.9	6.9	7.6	7.5	7.7	6.8
	Conductivity (µmhos/cm)	2190		2110		2080	*	2370 (2140)	
	Temperature (°C)	24.8	24.4	24.8	24.3	24.6	24.5	24.8	24.5
STOCK	Conductivity (µmhos/cm)	—		—		—		—	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* CELL CONSTANT INCORRECT. RE-CALIBRATED

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart



—•— **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)

ETS

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia

Chronic Reference Toxicant Control Chart

est 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	11-07-06	1.06																	
2	12-12-06	1.09	1.08	0.02	1.04	1.12	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.56	0.67	0.41	1.75	0.02
3	01-09-07	1.07	1.08	0.02	1.05	1.11	0.09	0.99	1.16	0.18	0.89	1.26	0.48	0.59	1.56	0.67	0.41	1.75	0.01
4	02-06-07	1.09	1.08	0.01	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
5	03-06-07	1.09	1.08	0.01	1.06	1.11	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.75	0.01
6	04-03-07	1.10	1.08	0.01	1.06	1.11	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.76	0.01
7	05-08-07	1.10	1.09	0.01	1.06	1.11	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.58	0.67	0.41	1.76	0.01
8	06-05-07	1.10	1.09	0.01	1.06	1.11	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.58	0.67	0.41	1.76	0.01
9	07-10-07	1.06	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	1.76	0.01
10	08-07-07	1.10	1.09	0.02	1.06	1.12	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.76	0.01
11	09-05-07	1.08	1.09	0.01	1.06	1.11	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.76	0.01
12	10-02-07	1.06	1.08	0.02	1.05	1.11	0.09	1.00	1.17	0.18	0.90	1.27	0.49	0.60	1.57	0.67	0.41	1.76	0.01
13	11-06-07	1.06	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.27	0.49	0.59	1.57	0.67	0.41	1.75	0.02
14	11-06-07	1.07	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
15	12-04-07	1.07	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
16	01-08-08	1.09	1.08	0.02	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
17	01-08-08	1.09	1.08	0.01	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.27	0.49	0.59	1.57	0.67	0.41	1.75	0.01
18	02-05-08	1.07	1.08	0.01	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
19	03-04-08	1.07	1.08	0.01	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	0.01
20	04-08-08	1.07	1.08	0.01	1.05	1.11	0.09	0.99	1.17	0.18	0.90	1.26	0.49	0.59	1.57	0.67	0.41	1.75	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	11-07-06	100	31.0		6.3		2.4	7.8	
2	12-12-06	100	28.0	29.5	6.7	6.5	2.2	8.0	7.9
3	01-09-07	100	27.6	28.9	4.9	6.0	2.4	8.6	8.1
4	02-06-07	100	29.9	29.1	7.6	6.4	2.9	9.8	8.6
5	03-06-07	100	30.1	29.3	6.0	6.3	2.6	8.7	8.6
6	04-03-07	100	33.1	30.0	4.4	6.0	2.2	6.6	8.3
7	05-08-07	100	32.0	30.2	8.5	6.3	2.7	8.4	8.3
8	06-05-07	100	28.4	30.0	7.5	6.5	2.5	8.7	8.3
9	07-10-07	100	29.3	29.9	6.0	6.4	2.5	8.5	8.3
10	08-07-07	100	28.7	29.8	7.5	6.5	2.9	10.0	8.5
11	09-05-07	100	29.7	29.8	5.7	6.5	2.5	8.4	8.5
12	10-02-07	100	29.5	29.8	9.4	6.7	2.4	8.2	8.5
13	11-06-07	100	28.0	29.6	6.1	6.7	2.5	8.8	8.5
14	11-06-07	100	30.4	29.7	5.6	6.6	2.2	7.2	8.4
15	12-04-07	100	31.8	29.8	5.5	6.5	2.5	7.9	8.4
16	01-08-08	100	30.3	29.9	6.6	6.5	2.2	7.3	8.3
17	01-08-08	100	31.8	30.0	4.9	6.4	2.4	7.7	8.3
18	02-05-08	100	31.3	30.1	6.4	6.4	2.8	9.1	8.3
19	03-04-08	100	31.5	30.1	8.0	6.5	2.7	8.5	8.3
20	04-08-08	100	29.6	30.1	7.7	6.6	2.6	8.8	8.4

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%.

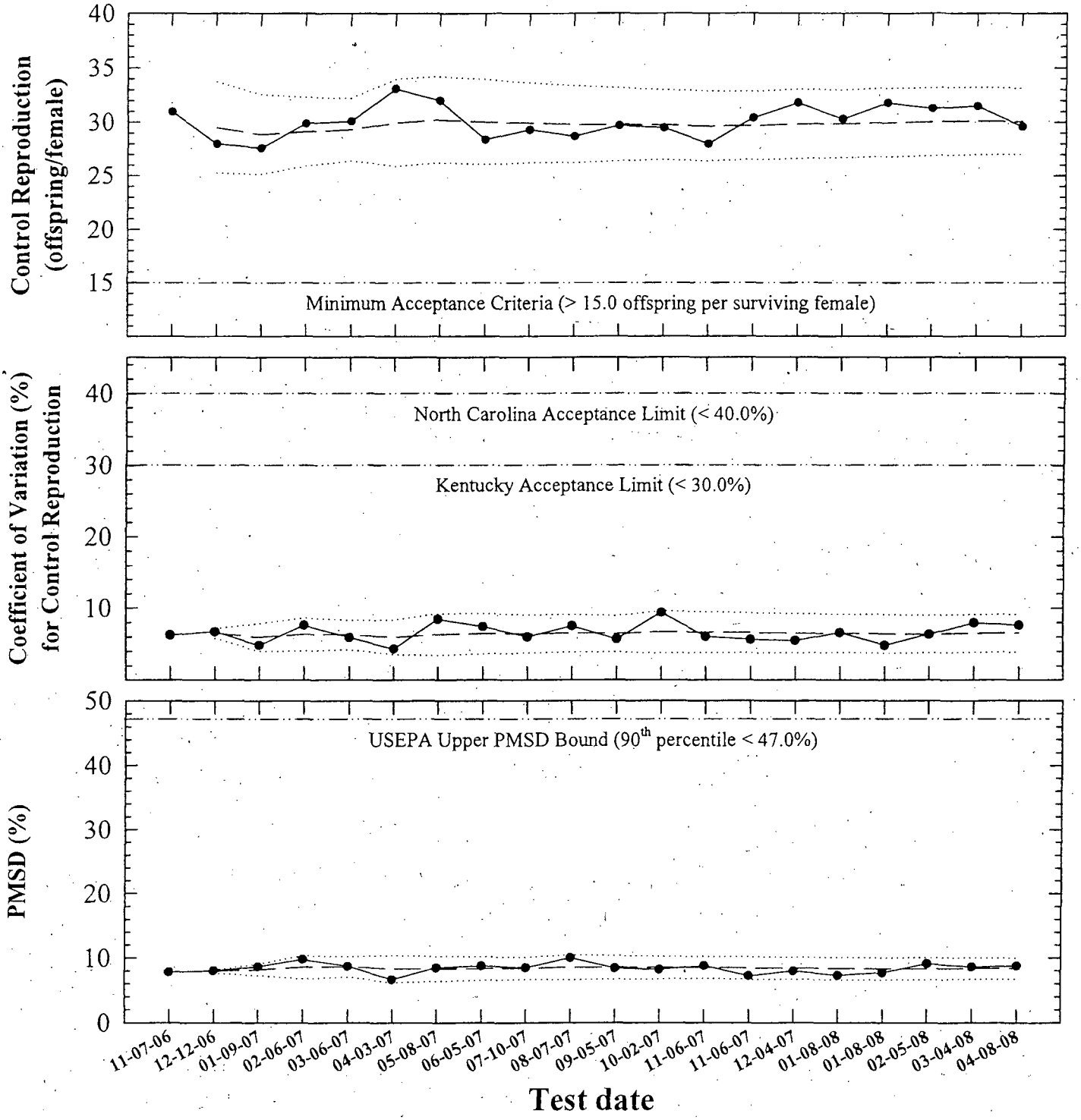
CT = Central Tendancy (Mean Control Reproduction, CV, or PMSD)

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)

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

CdNaCLCR #: 74

Dilution preparation information:						*Comments:*
NaCl CHM number:	CHM120					
Stock preparation:	100 g NaCl/l (dissolve 50 g NaCl in 500 ml deionized water)					
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism source information:											*Test information:*	
Organism age:	< 24-hours old										Randomizing template color:	ORANGE
Date and times organisms were born between:	04-08-08 0740 TO 1200										Incubator number and shelf location:	2B1
Culture board:	04-01-08 A											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	03-14-08
Culture board cup number:	1	2	3	4	5	6	7	8	9	10		
Transfer bowl information:	pH = 7.83 SU Temperature = 24.9 °C										*Selenastrum* batch:	03-24-08

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Analyst
0	04-08-08	1507	04-05-08 A ~~04-04-08B~~	JI
1	04-09-08	1505	04-05-08A	JI
2	04-10-08	1455	04-05-08 A	JI
3	04-11-08	1442	04-05-08 A	JI
4	04-12-08	1413	04-05-08 B	JI
5	04-13-08	1420	04-05-08 B	JI
6	04-14-08	1410	04-05-08 B	JI
7	04-15-08	1503		JI

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	1000
% Mortality:	0%	≤ 20%	LOEC	1200
Mean Offspring/Female:	29.6	≥ 15.0 offspring/female	ChV	1095.4
% CV:	7.7%	< 40.0 %	IC_{25}	1068.8

Species: *Ceriodaphnia dubia* CdNaCLCR #: 74

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	3	3	3	3	4	3	5	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	11	10	14	12	11	11	13	10	13	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	12	15	13	16	16	13	15	14	15
Total young produced		28	25	32	28	30	31	29	30	30	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:	29.6

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	3	3	3	4	4	3	3	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	10	12	12	14	11	10	13	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	13	15	15	16	14	14	13	16	14
Total young produced		34	26	30	30	34	29	27	29	31	27
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:	29.7
% Reduction from Control:	-0.3%

Species: *Ceriodaphnia dubia* CdNaCLCR #: 74

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	3	4	4	4	3	3	4	3	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	11	10	14	11	11	11	12	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	14	14	13	17	14	12	15	13	16	14
Total young produced		29	29	27	35	28	26	30	28	29	29
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:	29.0
% Reduction from Control:	2.0%

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	3	3	3	4	3	3	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	11	9	10	12	12	11	10	10	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	13	12	12	16	13	14	12	13	13
Total young produced		28	27	24	25	32	28	28	25	27	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:	27.4
% Reduction from Control:	7.4%

Species: *Ceriodaphnia dubia* CdNaCLCR #: 74

1200 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	2	0	0	3	3	3	1	2	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	1	3	0	0	0	0	0	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	6	9	6	4	7	2	5	5	8	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	8	4	0	7	6	2	4	7	3	5
Total young produced		17	15	7	14	16	7	12	13	13	10
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:	12.4
% Reduction from Control:	58.1%

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	0	0	2	0	1	3	1	1	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	1	0	3	0	2	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	2	3	0	0	0	2	0	3	1	1
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	3	2	2	0	4	0	0	0
Total young produced		3	3	6	4	4	3	7	4	2	4
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:	4.0
% Reduction from Control:	86.5%

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Verification of *Ceriodaphnia* Reproduction Totals

Control

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	3	3	3	3	4	3	5	3	3	33
5	0	0	0	0	0	0	0	0	0	0	0
6	11	10	14	12	11	11	13	10	13	15	120
7	14	12	15	13	16	16	13	15	14	15	143
Total	28	25	32	28	30	31	29	30	30	33	296

1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	3	3	3	4	3	3	3	4	4	33
5	0	0	0	0	0	0	0	0	0	0	0
6	10	11	9	10	12	12	11	10	10	13	108
7	15	13	12	12	16	13	14	12	13	13	133
Total	28	27	24	25	32	28	28	25	27	30	274

600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	3	3	3	4	4	3	3	3	3	34
5	0	0	0	0	0	0	0	0	0	0	0
6	13	10	12	12	14	11	10	13	12	10	117
7	16	13	15	15	16	14	14	13	16	14	146
Total	34	26	30	30	34	29	27	29	31	27	297

1200 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	2	0	0	3	3	3	1	2	0	17
5	0	0	1	3	0	0	0	0	0	2	6
6	6	9	6	4	7	2	5	5	8	3	55
7	8	4	0	7	6	2	4	7	3	5	46
Total	17	15	7	14	16	7	12	13	13	10	124

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	4	4	4	3	3	4	3	3	3	34
5	0	0	0	0	0	0	0	0	0	0	0
6	12	11	10	14	11	11	11	12	10	12	114
7	14	14	13	17	14	12	15	13	16	14	142
Total	29	29	27	35	28	26	30	28	29	29	290

1400 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	2	0	1	3	1	1	3	11
5	1	0	3	0	2	0	0	0	0	0	6
6	2	3	0	0	0	2	0	3	1	1	12
7	0	0	3	2	2	0	4	0	0	0	11
Total	3	3	6	4	4	3	7	4	2	4	40

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 #74
Test dates: April 08-15, 2008
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	28	25	32	28	30	31	29	30	30	33	100	29.6	7.7	Not applicable
600	34	26	30	30	34	29	27	29	31	27	100	29.7	9.3	-0.3
800	29	29	27	35	28	26	30	28	29	29	100	29.0	8.3	2.0
1000	28	27	24	25	32	28	28	25	27	30	100	27.4	8.8	7.4
1200	17	15	7	14	16	7	12	13	13	10	100	12.4	28.0	58.1
1400	3	3	6	4	4	3	7	4	2	4	100	4.0	37.3	86.5

Dunnett's MSD value: 2.593
PMSD: 8.8

MSD = Minimum Significant Difference
PMSD = *Percent Minimum Significant Difference*

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

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.

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Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/8/2008	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	4/15/2008	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	28.000	25.000	32.000	28.000	30.000	31.000	29.000	30.000	30.000	33.000
600	34.000	26.000	30.000	30.000	34.000	29.000	27.000	29.000	31.000	27.000
800	29.000	29.000	27.000	35.000	28.000	26.000	30.000	28.000	29.000	29.000
1000	28.000	27.000	24.000	25.000	32.000	28.000	28.000	25.000	27.000	30.000
1200	17.000	15.000	7.000	14.000	16.000	7.000	12.000	13.000	13.000	10.000
1400	3.000	3.000	6.000	4.000	4.000	3.000	7.000	4.000	2.000	4.000

			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	29.600	1.0000	29.600	25.000	33.000	7.671	10			29.650	1.0000
600	29.700	1.0034	29.700	26.000	34.000	9.262	10	103.50	75.00	29.650	1.0000
800	29.000	0.9797	29.000	26.000	35.000	8.289	10	90.50	75.00	29.000	0.9781
1000	27.400	0.9257	27.400	24.000	32.000	8.806	10	78.00	75.00	27.400	0.9241
*1200	12.400	0.4189	12.400	7.000	17.000	27.988	10	55.00	75.00	12.400	0.4182
*1400	4.000	0.1351	4.000	2.000	7.000	37.268	10	55.00	75.00	4.000	0.1349

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.06443608	1.035	0.13583268	0.20973463
Bartlett's Test indicates equal variances (p = 0.30)	6.04413986	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	1000	1200	1095.44512	
Treatments vs D-Control				

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	904.0625	119.866905	500	1008.5744	-1.5061
IC10	1009.53333	33.8804056	909.793846	1026.79054	-4.1474
IC15	1029.3	11.0645749	1010.98453	1044.77374	-2.3204
IC20	1049.06667	9.00623974	1031.52481	1064.62874	-0.0865
IC25	1068.83333	8.76984615	1051.34159	1084.63576	-0.0832
IC40	1128.13333	9.83797147	1107.13978	1146.30303	-0.1673
IC50	1167.66667	11.7104665	1143.50156	1187.52409	-0.1347

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

PMSD CALCULATION ONLY.

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	4/8/2008	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	4/15/2008	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	28.000	25.000	32.000	28.000	30.000	31.000	29.000	30.000	30.000	33.000
600	34.000	26.000	30.000	30.000	34.000	29.000	27.000	29.000	31.000	27.000
800	29.000	29.000	27.000	35.000	28.000	26.000	30.000	28.000	29.000	29.000
1000	28.000	27.000	24.000	25.000	32.000	28.000	28.000	25.000	27.000	30.000
1200	17.000	15.000	7.000	14.000	16.000	7.000	12.000	13.000	13.000	10.000
1400	3.000	3.000	6.000	4.000	4.000	3.000	7.000	4.000	2.000	4.000

			Transform: Untransformed						1-Tailed	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	29.600	1.0000	29.600	25.000	33.000	7.671	10			
600	29.700	1.0034	29.700	26.000	34.000	9.262	10	-0.088	2.287	2.593
800	29.000	0.9797	29.000	26.000	35.000	8.289	10	0.529	2.287	2.593
1000	27.400	0.9257	27.400	24.000	32.000	8.806	10	1.940	2.287	2.593
*1200	12.400	0.4189	12.400	7.000	17.000	27.988	10	15.166	2.287	2.593
*1400	4.000	0.1351	4.000	2.000	7.000	37.268	10	22.572	2.287	2.593

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)	1.06443608	1.035	0.13583268	0.20973463
Bartlett's Test indicates equal variances (p = 0.30)	6.04413986	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	1000	1200	1095.44512		2.59342303	0.08761564	1222.73667	6.43148148	5.5E-33	5, 54
Treatments vs D-Control										

Species: *Ceriodaphnia dubia* CdNaCLCR #: 74

Daily Chemistry:

		Day 0		Day 1		Day 2		
	Analyst	KEK	KEK	KEK	LAB	LAB	~~LAB~~ KEK	
Concentration	Parameter							
CONTROL	pH (S.U.)	8.25	7.93	7.91	7.72	7.57	~~7.72~~	8.00
	DO (mg/L)	7.8	7.6	7.6	8.0	8.0	7.6	
	Conductivity (µmhos/cm)	311		314		316		
	Alkalinity (mg $CaCO_3$/L)	59						
	Hardness (mg $CaCO_3$/L)	96						
	Temperature (°C)	24.7	24.9	24.8	24.6	25.0	24.7	
600 mg NaCl/L	pH (S.U.)	8.15	7.89	7.91	7.68	7.64	~~7.68~~	7.97
	DO (mg/L)	7.6	7.6	7.6	7.9	8.0	7.6	
	Conductivity (µmhos/cm)	1380		1430		1460		
	Temperature (°C)	24.9	25.2	24.9	24.8	24.9	24.8	
800 mg NaCl/L	pH (S.U.)	8.12	7.89	7.89	7.66	7.62	~~7.66~~	7.95
	DO (mg/L)	7.6	7.7	7.6	7.9	8.0	7.6	
	Conductivity (µmhos/cm)	1770		1800		2020		
	Temperature (°C)	24.9	25.2	24.9	24.8	24.9	24.8	
1000 mg NaCl/L	pH (S.U.)	8.10	7.87	7.80	7.64	7.63	~~7.64~~	7.94
	DO (mg/L)	7.6	7.7	7.6	7.9	8.0	7.6	
	Conductivity (µmhos/cm)	2110		2210		2350		
	Temperature (°C)	24.8	25.2	24.9	24.8	24.9	24.7	
1200 mg NaCl/L	pH (S.U.)	8.08	7.85	7.87	7.64	7.63	~~7.64~~	7.92
	DO (mg/L)	7.7	7.7	7.6	8.0	7.9	7.5	
	Conductivity (µmhos/cm)	2450		2460		2820		
	Temperature (°C)	25.0	25.1	24.9	24.7	24.8	24.9	
1400 mg NaCl/L	pH (S.U.)	8.07	7.84	7.87	7.63	7.63	~~7.63~~	7.91
	DO (mg/L)	7.7	7.6	7.6	8.0	7.9	7.5	
	Conductivity (µmhos/cm)	2790		2810		3330		
	Temperature (°C)	24.9	24.9	24.8	24.8	24.8	24.9	
STOCK	Conductivity (µmhos/cm)	121000		—		—		
		Initial	Final	Initial	Final	Initial	Final	

*HIGH CELL CONSTANT FOR

Species: *Ceriodaphnia dubia* CdNaCLCR #: 74

		Day							
		3		4		5		6	
	Analyst	KEK	LAB	LAB	LAB	LAB	MM	MM	[illegible]
Concentration	Parameter								
CONTROL	pH (S.U.) 8.03	~~7.57~~	8.01	8.01	7.94	7.97	7.88	8.01	7.88
	DO (mg/L)	7.5	7.5	7.4	7.8	7.5	7.7	7.6	8.0
	Conductivity (µmhos/cm)	324 ~~310~~		324		324		335	
	Alkalinity (mg $CaCO_3$/L)			59					
	Hardness (mg $CaCO_3$/L)			92					
	Temperature (°C)	24.7	25.2	24.9	24.7	24.7	24.8	24.7	24.5
600 mg NaCl/L	pH (S.U.) 8.00	~~7.64~~	7.99	7.98	7.92	7.96	7.88	7.94	7.90
	DO (mg/L)	7.5	7.5	7.4	7.7	7.5	7.7	7.7	8.0
	Conductivity (µmhos/cm)	1460		1360		1410		1350	
	Temperature (°C)	24.7	25.0	24.8	24.9	24.7	25.0	24.8	24.8
800 mg NaCl/L	pH (S.U.) 8.00	~~7.62~~	7.98	7.97	7.91	7.98	7.89	7.96	7.91
	DO (mg/L)	7.5	7.6	7.6	7.7	7.6	7.7	7.8	8.0
	Conductivity (µmhos/cm)	1900 ~~2020~~		1850		1930		1810	
	Temperature (°C)	24.7	25.0	24.8	24.8	24.6	25.0	24.8	24.8
1000 mg NaCl/L	pH (S.U.) 7.99	~~7.63~~	8.01	7.96	7.92	7.97	7.89	7.96	7.92
	DO (mg/L)	7.5	7.6	7.7	7.7	7.7	7.7	7.7	8.0
	Conductivity (µmhos/cm)	2210 ~~2350~~		2210		2280		2310	
	Temperature (°C)	24.9	24.8	24.8	25.0	24.6	24.7	24.8	24.6
1200 mg NaCl/L	pH (S.U.) 7.98	~~7.63~~	7.98	7.96	7.90	7.96	7.89	7.96	7.92
	DO (mg/L)	7.5	7.5	7.7	7.8	7.8	7.7	7.8	8.0
	Conductivity (µmhos/cm)	2730 ~~2820~~		2590		2670		2700	
	Temperature (°C)	24.7	24.9	24.8	24.9	24.6	24.9	24.8	24.7
1400 mg NaCl/L	pH (S.U.) 7.97	~~7.63~~	7.97	7.95	7.91	7.97	7.88	7.96	7.91
	DO (mg/L)	7.5	7.6	7.7	7.9	7.8	7.7	7.8	8.0
	Conductivity (µmhos/cm)	~~3330~~ 3080		3010		3150		3160	
	Temperature (°C)	24.9	24.7	24.8	24.9	24.6	24.9	24.8	24.6
STOCK	Conductivity (µmhos/cm)	—		—		—		—	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

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

ATTN: Stephanie A. Howard

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

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	08	04	01	To	08	04	30

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	7.6	********	8.9	12	0	13 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	66	80	26	********	7	9	19	0	5 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<47	<58	26	********	<5	<6	19	0	5 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.138	1.473	03	********	********	********	**	0	30 / 30	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		
Timothy P. Cleary 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 Asterward Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	05	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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	08	04	01	To	08	04	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	05	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	04	01	To	08	04	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	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		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	08	05	13
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	110 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	04	01	To	08	04	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
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		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	08	04	01	To	08	04	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	05	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Operations performs visual inspections for floating debris and oil and grease during all backwashes.

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

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

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	08	04	01	To	08	04	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

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

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

Operations performs visual inspections for floating debris and oil and grease during all backwashes.

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

TTN: 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	08	04	01	To	08	04	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Timothy P. Cleary Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	08	05	13
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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