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

November 13, 2002

State of Tennessee
Department of Environment and Conservation
Division of Water Pollution Control
Enforcement & Compliance Section
6th Floor, L & C Annex
401 Church Street
Nashville, Tennessee 37243-1534

Attention: Ms. Evelyn Haskin

Dear Ms. Haskin:

TENNESSEE VALLEY AUTHORITY - DISCHARGE MONITORING REPORT FOR SEQUOYAH NUCLEAR PLANT

Please find enclosed the Discharge Monitoring Report (DMR) of October 2002 for Sequoyah. Please contact me at (423) 843-7630 if you have any questions or comments.

Sincerely,

Jerry D. Osborne
Acting Environmental Supervisor
Signatory Authority for
Richard T. Purcell
Site Vice President
Sequoyah Nuclear Plant

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

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

IE25

Printed on recycled paper

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN Jerry D Osborne

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	02	10	01	To	02	10	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved
OMB No 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	26.6	(04)	0	31 / 31	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	39.9	(04)	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH	SAMPLE MEASUREMENT	********	********	**	7.4	********	7.6	(12)	0	10 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	6	7	(19)	0	5 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	(19)	0	5 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1735	(03)	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	<0.009	0.017	(19)	0	36 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.036	0.058 INST MAX	MG/L		WEEK-DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President TYPED OR PRINTED	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7630	02	11	14
			AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following injections occured· 1. PCL-222 (max. calc. conc. was 0 054mg/L--limit 0 100mg/L) 2 CL-363 (max. calc. conc. was 0 009mg/L--limit 0 100mg/L) 3 PCL-222/PCL-401 (max. calc conc. was 0 026mg/L--limit 0.100mg/L)

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Location HAMILTON COUNTY

ATTN: Jerry D. Osborne

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	02	10	01	To	02	10	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT
*** NO DISCHARGE [ ] ***

Form Approved.
OMB No 2040-0004

NOTE: Read instructions before completing this form

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.1	(62)	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG C /HR		CONTIN UOUS	CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.7	(04)	0	31 / 31	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0	DEG. C.		CONTIN UOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.2	<0.2	<0.2	(19)	0	1 / 31	GRAB
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	REPORT	REPORT	REPORT	MG/L		ONCE/ MONTH	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President TYPED OR PRINTED	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423 AREA CODE	843-7630 NUMBER	02 YEAR	11 MO	14 DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here*
CCW data for October 2002 is attached.

CCW Data for October 2002

CCW CHANNEL

DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
October 11, 2002	< 0.5	

CCW TRENCH DISCHARGE

DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
October 11, 2002	0.8	

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN. Jerry D. Osborne

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	02	10	01	To	02	10	31

MAJOR
(SUBR 01)
F - FINAL
BIOMONITORING FOR OUTFALL 101
EFFLUENT
*** NO DISCHARGE ☐ ***

Form Approved
OMB No 2040-0004

NOTE: Read instructions before completing this form

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100	********	********	(23)	0	1 / 90	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MINIMUM	********	********	PERCENT		QUART-ERLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100	********	********	(23)	0	1 / 90	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MIMINUM	********	********	PERCENT		QUART-ERLY	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President TYPED OR PRINTED	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7630	02	11	14
			AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here*
Toxicity was sampled October 6-11, 2002. Report is attached.

November 7, 2002

Richard D. Nunley, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, OCTOBER, 2002

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 October 6-11, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples to remove pathogenic interferences. Fish pathogens present in intake water have been the suspected cause of anomalous dose responses and high variability among replicates in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to routine compliance samples and UV treated samples.

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

Cynthia L. Russell

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

Attachment
cc (Attachment):
Files, ER&TA, CEB 1B-M
SQN October 2002m

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: November 7, 2002

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN 0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: October 6-11, 2002
10. Average Flow on Days Sampled (MGD): 165~~4~~7, 165~~7~~6, 165~~6~~9 RAMH 11/13/02
11. Pertinent Site Conditions: No unusual conditions reported. (Production / operation data will be provided upon request).
12. Test Dates: October 8-15, 2002
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 10.98, 22, 43.9, 72, 100
    Intake: 100
    Pimephales promelas: UV treated Outfall 101: 10.98, 22, 43.9, 72, 100
    UV treated Intake: 100
16. Permit Limit Endpoint (%): Outfall 101: $IC_{25} = 43.9\%$

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

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

18. Facility Contact: Richard D. Nunley
Phone #: (423) 843-7748

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

20. Lab Contact: Jim Sumner
Phone #: (828) 862-8193

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

22) Notes: Outfall 101 samples collected October 6-11, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples to remove pathogenic interferences. Fish pathogens present in intake water have been the suspected cause of anomalous dose responses and high variability among replicates in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to routine compliance samples and UV treated samples.

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (EST) Collected	Date (MM/DD/YY)/ Time (EST) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (EST) Used
101	10/06/02 0740 to 10/07/02 0641	10/08/02 1059	0.3†	<0.10	10/08/02 1559 10/09/02 1555
Intake	10/06/02 0756 to 10/07/02 0656	10/08/02 1059	0.3	<0.10	10/08/02 1559 10/09/02 1555
101	10/08/02 1049 to 10/09/02 0949	10/10/02 1052	0.8†	<0.10	10/10/02 1552 10/11/02 1520
Intake	10/08/02 1109 to 10/09/02 1009	10/10/02 1052	0.8	<0.10	10/10/02 1522 10/11/02 1520
101	10/10/02 1329 to 10/11/02 1230	10/12/02 1105	2.4†	<0.10	10/12/02 1531 10/13/02 1526 10/14/02 1524
Intake	10/10/02 1342 to 10/11/02 1242	10/12/02 1105	2.4	<0.10	10/12/02 1531 10/13/02 1526 10/14/02 1524

*TRC = Total Residual Chlorine
†Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival

4. Sample Manipulation: Samples from Outfall 101 and the 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 Rainbow Lifeguard® UV Sterilizer for 2 minutes.

Test Organisms:	*Pimephales promelas*	*Ceriodaphnia dubia*
1. Source:	Aquatic BioSystems, Inc.	In-house Cultures
2. Age:	24.5-27.5 hours old	< 24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6) Test Initiation: (Date/Time)		
Outfall 101	10/08/02-1559 EST	10/08/02-1219 EST
UV Treated Outfall 101	10/08/02-1559 EST	
7) Test Termination: (Date/Time)		
Outfall 101	10/15/02-1544 EST	10/14/02-1159 EST
UV Treated Outfall 101	10/15/02-1609 EST	
8) Test Temperature: Outfall 101:	Mean = 24.8 °C (24.2-25.3°C)	Mean = 24.9°C (24.3-25.3°C)

Test Temperature: UV-Treated Outfall 101: Mean = 24.6°C (24.4-25.4°C)

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

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

TOXICITY TEST RESULTS (see Appendix B for Bench Sheets)

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

Conducted October 8-15, 2002 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	98	98	98	98
10.98%	100	100	100	100	100	100	100
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

96-hour LC_{50} Value: > 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUa*

Permit Limit: 1.0 TUa

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.982	0.988	0.862	0.929	0.940
10.98%	0.927	1.019	0.845	0.969	0.940
22%	0.958	0.904	0.900	0.920	0.920
43.9%	1.008	1.000	1.037	0.936	0.995
72%	0.903	1.017	0.827	0.930	0.919
100%	1.024	0.979	1.004	0.975	0.995
Intake	1.053	1.090	1.041	0.928	1.028

IC_{50} Value: > 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUc*

Permit Limit: 1.0 TUc

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

TOXICITY TEST RESULTS (see Appendix B for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic 7-day Toxicity Test.
(Genus species) (Type / Duration)
Conducted October 8-14, 2002 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

96-hour LC_{50} Value: > 100%	Calculated TU Estimates: < 1.0 TUa*
95% Confidence Limits: NA Upper Limit: NA Lower Limit: NA	Permit Limit: 1.0 TUa

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	32	25	30	13	30	29	30	29	28	28	27.4
10.98%	31	32	31	25	30	15	29	30	31	32	28.6
22%	36	31	30	29	27	37	33	33	29	31	31.6
43.9%	32	29	30	34	30	39	34	35	30	30	32.3
72%	33	32	36	38	31	37	34	33	30	37	34.1
100%	34	36	36	33	39	35	20	37	37	41	34.8
Intake	32	30	30	32	27	20	33	14	28	28	27.4

IC_{50} Value: > 100%	Calculated TU Estimates: < 1.0 TUc*
95% Confidence Limits: NA Upper Limit: NA Lower Limit: NA	Permit Limit: 1.0 TUc

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

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

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

Conducted October 8-15, 2002 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	98	98	98	98	98	98
22%	100	100	100	98	98	98	98
43.9%	100	100	100	100	100	100	100
72%	100	100	100	100	100	100	100
100%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

96-hour LC_{50} Value: > 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUa*

Permit Limit: 1.0 TUa

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	1.200	1.195	1.154	0.990	1.135
10.98%	0.982	1.000	0.995	0.959	0.984
22%	1.149	1.156	1.035	0.843	1.045
43.9%	1.191	1.090	1.025	1.102	1.102
72%	1.173	1.034	0.940	1.193	1.085
100%	1.150	1.081	1.270	1.122	1.156
Intake	1.185	1.117	1.052	1.030	1.096

IC_{50} Value: > 100%

95% Confidence Limits: NA
Upper Limit: NA
Lower Limit: NA

Calculated TU Estimates: < 1.0 TUc*

Permit Limit: 1.0 TUc

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

REFERENCE TOXICANT TEST RESULTS (see Appendix A and C)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Ceriodaphnia dubia	October 8-15, 2002	1116	7-days	NaCl	1026.9 mg/L
Pimephales promelas	October 8-15, 2002	1500	7-days	KCl	525.7 mg/L

SUMMARY / CONCLUSIONS

Outfall 101 samples collected October 6-11, 2002, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples to remove pathogenic interferences. Fish pathogens present in intake water have been the suspected cause of anomalous dose responses and high variability among replicates in previous toxicity testing at Sequoyah. At the time this study was conducted, insignificant mortality occurred in minnows exposed to routine compliance samples and UV treated samples.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1. *Pimephales promelas*

   Tests were conducted according to EPA/600/4-91/002 (July 1994) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 400-mL polypropylene beakers, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

   Tests were conducted according to EPA/600/4-91/002 (July 1994) using ten replicates, each containing one test organism, per treatment. Test vessels consisted of 30-mL polypropylene cups, each containing 15-mL of test solution.

DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

PHYSICAL AND CHEMICAL METHODS

1. Regents, Titrants, Buffers, etc.: All chemicals were certified products used before expiration dates (where applicable).

2. Instruments: All identification, service, and calibration information pertaining to laboratory instruments is recorded in calibration and maintenance logbooks.

3. Temperature was measured using EPA Method 170.1.

4. Dissolved oxygen was measured using EPA Method 360.1.

5. The pH was measured EPA Method 150.1.

6. Conductance was measured EPA Method 120.1.

7. Alkalinity was measured using EPA Method 310.1.

8. Hardness was measured EPA Method 130.2.

9. Total residual chlorine was measured using EPA Method 330.5.

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage, glassware preparation, test organism culturing/acquisition and acclimation, test organism handling during test, and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA/600/4-91/002. Any known deviations were noted during the study and are reported herein.

REFERENCE TOXICANT TESTS (See Appendix C for control chart information)

1. Test Type: 7-day chronic tests with results expressed as IC_{25} values in g 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. Lewis, P. A., D. J. Klemm, J. M. Lazorchak, T. J. Norberg-King, W. H. Peltier, M. A. Heber. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA/600/4-91/002 (July 1994).

3. Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79/020 (March 1983).

Sequoyah Nuclear Plant Biomonitoring
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Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

Diffuser Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling,

And

Initial and Final Chemistry for Fathead Minnow 7-day and Daphnid 3-brood Chronic Tests

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-October ~~8~~ 11, 2002

RAMH 11/13/02

Date	Sodium hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
03/12/1998	0.016	-		-		-	
03/13/1998	0.015	-		-		-	
03/14/1998	0.013	-		-		-	
03/15/1998	0.030	-		-		-	
03/16/1998	0.013	-		-		-	
03/17/1998	0.020	-		-		-	
03/18/1998	0.018	-		-		-	
09/08/1998	0.015	-	0.014	0.005		-	0.021
09/09/1998	0.003	-	0.031	0.011		-	
09/10/1998	0.014	-	0.060	0.021		-	
09/11/1998	0.013	-	0.055	0.019		-	
09/12/1998	<0.001	-	0.044	0.015		-	
09/13/1998	<0.001	-	0.044	0.015		-	
09/14/1998	0.008	-	0.044	0.015		-	
02/22/1999	<0.001	-		-		-	
02/23/1999	0.005	-		-		-	
02/24/1999	0.009	-		-		-	
02/25/1999	0.012	-		-		-	
02/26/1999	0.008	-		-		-	
02/27/1999	<0.001	-		-		-	
02/28/1999	<0.001	-		-		-	
08/18/1999		0.015	0.069	0.024	0.006	-	
08/19/1999		0.012	0.068	0.024		-	
08/20/1999		0.023	0.070	0.024		0.120	
08/21/1999		0.022	0.068	0.024		-	
08/22/1999		0.022	0.068	0.024		-	
08/23/1999		0.025	0.068	0.024	0.006	-	
08/24/1999		0.016	0.067	0.023	0.020	-	

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-October ~~6~~ 11, 2002 RAHH 11/13/02

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	-	-	0.021
07/27/2000	-	0.019	0.055	0.019	-	-	-
07/28/2000	-	0.0088	0.053	0.018	0.004	0.108	-
07/29/2000	-	< 0.0088	0.055	0.019	-	-	-
07/30/2000	-	< 0.0076	0.055	0.019	-	-	-
07/31/2000	-	< 0.0152	0.055	0.019	0.006	-	-
08/01/2000	-	< 0.0141	0.055	0.019	0.005	-	-
12/11/2000	-	0.0143	0.025	0.020	0.005	-	-
12/12/2000	-	0.0092	0.025	0.020	0.005	-	-
12/13/2000	-	< 0.0120	0.025	0.020	-	-	-
12/14/2000	-	< 0.0087	0.025	0.020	-	-	-
12/15/2000	-	0.0120	0.025	0.020	0.005	-	-
12/16/2000	-	< 0.0036	0.025	0.020	-	-	-
12/17/2000	-	< 0.0036	0.025	0.020	-	-	-
08/26/2001	-	0.017	0.06	0.021	0.006	-	-
08/27/2001	-	<0.0096	0.06	0.021	0.005	-	0.021
08/28/2001	-	<0.0085	0.06	0.021	-	-	-
08/29/2001	-	<0.0094	0.059	0.020	0.005	-	0.021
08/30/2001	-	<0.0123	0.06	0.021	0.005	-	-
08/31/2001	-	<0.005	0.059	0.020	-	-	-
11/25/2001	-	<0.0044	-	-	-	-	-
11/26/2001	-	<0.0119	0.024	0.02	0.005	-	-
11/27/2001	-	0.0137	0.023	0.019	0.007	-	-
11/28/2001	-	<0.0089	0.022	0.019	0.006	-	-
11/29/2001	-	0.0132	0.024	0.02	0.007	-	-
11/30/2001	-	< 0.0043	0.024	0.02	-	-	-
12/09/2001	-	<0.0042	-	-	-	-	-
12/10/2001	-	<0.0042	-	-	-	-	-
12/11/2001	-	<0.0104	-	-	-	-	-
12/12/2001	-	0.0128	0.024	0.02	0.008	-	-
12/13/2001	-	<0.0088	0.024	0.02	-	-	-
12/14/2001	-	0.0134	0.024	0.02	0.007	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-October ~~6~~ 11, 2002

RAMH 11/13/02

Date	Sodium hypochlorite	Towerbrom	PCL-222	PCL-401	CL-363	Cuprostat-PF	H-130M
	mg/L TRC	mg/L TRC	mg/L Phosphate	mg/L Copolymer	mg/L DMAD	mg/L Azole	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	-	~~<0.00042~~ <0.0042	0.054	0.018	-	-	-

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PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, October 8-15, 2002.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
Pimephales promelas	Control	24.5 24.2 - 24 7	25.0 24 8 - 25 3	8 0 7 8 - 8 4	7.2 6 9 - 7.7	7 87 7.71 - 7 97	7.51 7 25 - 7 79	306 294 - 314	61 60 - 62	83 82 - 86	
	10.98%	24 6 24 4 - 24.7	25 0 24 8 - 25 3	8 0 7 8 - 8 2	7.2 6 9 - 7.7	7.87 7 82 - 7.94	7 45 7.20 - 7 78	293 283 - 302			
	22%	24 6 24 4 - 24 8	25 0 24 8 - 25 3	8 0 7 8 - 8 2	7.0 6 6 - 7 7	7.86 7.82 - 7 93	7.45 7 24 - 7.74	280 270 - 288			
	43.9%	24.7 24 5 - 24 8	25 0 24 8 - 25.3	8.1 7 9 - 8 3	7 0 6 5 - 7.7	7.83 7 80 - 7 90	7 44 7 17 - 7.76	255 247 - 263			
	72%	24 7 24 5 - 24 9	25.0 24 8 - 25.3	8 1 7.9 - 8 3	7.0 6 5 - 7.7	7.76 7 62 - 7 85	7.43 7 21 - 7.73	220 214 - 226			
	100%	24 8 24.5 - 25 0	25 0 24 8 - 25 3	8.1 7 9 - 8.3	7 0 6 4 - 7 8	7.74 7 66 - 7.90	7 42 7.19 - 7.74	188 182 - 192	62 61 - 63	82 72 - 100	< 0 10 < 0.10 - < 0 10
	Intake	24.7 24.4 - 25 2	25 0 24 8 - 25 3	8.2 8 0 - 8 4	7.2 6 4 - 8 0	7.67 7 42 - 7.84	7 41 7 21 - 7 81	186 181 - 195	60 57 - 62	83 80 - 86	< 0.10 < 0.10 - < 0 10
Ceriodaphnia dubia	Control	24.5 24 3 - 24 6	25.1 24 9 - 25 3	8 0 7 8 - 8 4	8 1 7.7 - 8 4	7.86 7.71 - 7.97	7.95 7 82 - 8 05	305 294 - 314	62 61 - 62	84 82 - 86	
	10.98%	24.6 24 4 - 24 7	25.1 24 9 - 25.3	8 0 7 8 - 8 2	8 1 7.7 - 8.4	7.88 7 83 - 7.94	7.96 7.75 - 8 10	292 283 - 301			
	22%	24 6 24 4 - 24.7	25.1 24 9 - 25 3	8 0 7 8 - 8 2	8.1 7.8 - 8 4	7 86 7 82 - 7.93	7.96 7.76 - 8 11	279 270 - 286			
	43.9%	24 6 24 5 - 24 7	25.1 24.9 - 25.3	8.1 7 9 - 8 3	8 2 7.9 - 8 4	7.83 7 80 - 7.90	7.96 7.74 - 8 15	254 247 - 261			
	72%	24.7 24 6 - 24 9	25.1 24.9 - 25 3	8 1 7 9 - 8 3	8.2 7.9 - 8 4	7.76 7 62 - 7.85	7.96 7.71 - 8 13	220 214 - 224			
	100%	24.8 24 6 - 25 3	25.1 24 9 - 25 3	8.1 7.9 - 8 3	8.3 8 0 - 8 5	7.73 7.66 - 7.90	7.94 7 76 - 8.10	187 182 - 192	62 61 - 63	82 72 - 100	< 0.10 < 0.10 - < 0 10
	Intake	24 8 24 6 - 25 2	25.1 24.9 - 25 3	8 2 8 0 - 8 4	8.2 8 0 - 8 4	7 66 7 42 - 7 84	7.90 7.75 - 8 07	186 181 - 195	60 57 - 62	83 80 - 86	< 0 10 < 0.10 - < 0 10

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV Treated Outfall 101, October 8-15, 2002.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance (µmhos/cm)	Alkalinity (mg/L $CaCO_3$)	Hardness (mg/L $CaCO_3$)	Total Residual Chlorine (mg/L)
		Initial	Final	Initial	Final	Initial	Final				
Pimephales promelas	Control	24 5 24 4 - 24 7	25 0 24.7 - 25.2	8 0 7.7 - 8 5	7 1 6 4 - 7.8	7 86 7.77 - 7 92	7.42 7 26 - 7.66	299 291 - 313	61 60 - 62	83 82 - 86	
	10.98%	24.6 24 5 - 24 9	25 0 24.7 - 25 2	8 0 7 7 - 8 5	7.1 6 4 - 7 8	7 84 7.73 - 7 90	7.42 7.22 - 7 68	293 284 - 306			
	22%	24.7 24 5 - 24 9	25 0 24 7 - 25.2	8.0 7 7 - 8 5	7.1 6 6 - 7 9	7 82 7.72 - 7.89	7.40 7 22 - 7 65	280 270 - 297			
	43.9%	24.7 24 5 - 24 8	25 0 24 7 - 25.2	8 0 7 7 - 8 5	7 0 6 6 - 7 8	7.81 7 67 - 7 88	7.38 7 23 - 7.63	257 246 - 277			
	72%	24.7 24 5 - 24.9	25.0 24 7 - 25 2	8 0 7 6 - 8 5	7.0 6 6 - 7.7	7.79 7 65 - 7.86	7.38 7 24 - 7.62	222 214 - 237			
	100%	24.8 24 5 - 25 1	25 0 24.7 - 25 2	8 0 7 6 - 8 4	7.0 6 5 - 7.7	7.72 7.59 - 7 82	7.36 7.20 - 7 63	189 180 - 200	62 61 - 63	82 72 - 100	< 0.10 < 0 10 - < 0.10
	Intake	24 8 24 5 - 25 4	25 0 24 7 - 25 2	8.0 7.7 - 8 4	7.0 6 6 - 7 9	7.70 7 55 - 7.78	7.39 7 20 - 7.64	185 180 - 191	60 57 - 62	83 80 - 86	< 0.10 < 0.10 - < 0 10

Sequoyah Nuclear Plant Biomonitoring
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Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
10-01-02	0834	J Sumner	D. Trammel	0.6°C	474	021001.01	~~Duke Energy Corp.~~ Test America Cherokee WWTP	NC	
10-01-02	1052	KEKeenan	Fedex	3.2°C	473	021001.02	Duke Energy Corp. Dan River Steam Station	NC	
10-02-02	0745	KEKeenan	L. Carreiro	1.1°C	475	0210.02.01	Asheville, North Fork WTP	NC	
10-02-02	1159	KEKeenan	Fedex	3.9°C	476	021002.02	Georgetown Steel Scale Pit	SC	
10-02-02	1159	KEKeenan	Fedex	3.7°C	477	021002.03	Duke Energy Corp. Riverbend Steam Station	NC	
10-02-02	1200	KEKeenan	Fedex	1.4°C	478	021002.04	PCS Phosphate Outfall 007	NC	
10-02-02	1200	KEKeenan	Fedex	0.5°C	478	021002.05	PCS Phosphate Outfall 100	NC	
10-03-02	0900	J Sumner	D. Trammel	0.4°C	474	021003.01	Test America Cherokee WWTP	NC	
10-04-02	1340	J. Sumner	Fedex	9.5°C	479	021004.01	Alcoa EP	NC	Sample exceeded acceptable temperature upon receipt
10-05-02	1050	KEKeenan	L. Carreiro	0.3°C	475	021005.01	Asheville, North Fork WTP	NC	
10-05-02	1050	KEKeenan	Fedex	2.4°C	477	021005.02	Duke Energy Corp. Riverbend Steam Station	NC	
10-05-02	1051	KEKeenan	D. Trammel	0.3°C	474	021005.03	Test America Cherokee WWTP	NC	
10-08-02	1047	KEKeenan	Fed-ex	2.7°C	480	021008.01	South Island PSD	SC	
10-08-02	1047	KEKeenan	Fed-ex	0.5°C	481	021008.02	Anderson Co. Sewer Authority	SC	
10-08-02	1048	KEKeenan	Fedex	0.3°C	482	021008.03	Roxboro WWTP	NC	
10-08-02	1059	KEKeenan	Fedex	0.3°C	483	021008.04	TVA Sequoyah Nuclear Plant Outfall	TN	
10-08-02	1059	KEKeenan	Fedex	0.3°C	483	021008.05	TVA Sequoyah Nuclear Plant Intake	TN	
10-09-02	0743	KEKeenan	Greyhound	0.3°C	484	021009.01	Aquasource - Fieldcrest Mills	NC	
10-09-02	0742	KEKeenan	D. Trammel	0.8°C	485	021009.02	Test America Maggie Valley NC WWTP	NC	
10-09-02	1100	KEKeenan	M. Teague	3.8°C	486	021009.03	Environmental, Inc Bryson City WWTP	NC	
10-09-02	1101	KEKeenan	Fed-ex	3.7°C	487	021009.04	Duke Energy Corporation Allen Steam Station	NC	

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
10.09.02	1101	KKeheeran	Fed ex	3.1°C	488	021009.05	CORR ERI - AAF McQuay	NC	
0.09.02	1102	KKeheeran	Fed ex	9.6°C	489	021009.06	Georgetown Steel - DRI Plant	SC	* sample exceeded acceptable temperature upon receipt.
0-10-02	1050	KEKeenan	Fedex	0.9°C	482	021010.01	Roxboro WWTP	NC	
0-10-02	1052	KEKeenan	Fedex	0.8°C	483	021010.02	TVA - Outfall 101 Sequoyah Nuclear Plant	TN NC	
0-10-02	1052	KEKeenan	Fedex	0.8°C	483	021010.03	TVA - Intake Sequoyah Nuclear Plant	TN	
0-10-02	1059	KEKeenan	Fedex	0.3°C	490	021010.04	TVA - Colbert Fossil Plant Pond 5		
0-10-02	1100	KEKeenan	Fedex	0.3°C	481	021010.05	Anderson County Sewer Authority	SC	
-11-02	1440	KEKeenan	A. Wike	1.9°C	486	021010.06 11.01	Environmental Inc. Bryson City WWTP	NC	
-12-02	1102	KEKeenan	Fedex	1.3°C	481	021010.01 12.01	Anderson County Sewer Authority	SC	
-12-02	1102	KEKeenan	D. Trammel	2.4°C	485	021012.02	Test America Maggie Valley WWTP	NC	
12-02	1103	KEKeenan	Fedex	1.0°C	482	021012.03	Roxboro WWTP	NC	
12-02	1103	KEKeenan	Fedex	2.2°C	488	021012.04	Corr Ert AAF McQuay	NC	
12-02	1104	KEKeenan	Greyhound	3.3°C	484	021012.05	AquaSource Fieldcrest Hills	NC	
12-02	1104	KEKeenan	Fedex	3.1°C	487	021012.06	Duke Energy Corp. Allen Steam Station	NC	
12.02	1105	KEKeenan	Fedex	2.4°C	483	021012.07	TVA - Sequoyah Nuclear Plant Outfall 101	TN	
12.02	1105	KEKeenan	Fedex	2.4°C	483	021012.08	TVA - Sequoyah Nuclear Plant Intake	TN	
5.02	1051	KKeheeran	Fed ex	1.8°C	491	021015.01	TVA - PAF-U3 Addition TOX PAF-BA-A	KY	
6.02	1051	KKeheeran	Fedex	1.0°C	491	021015.02	TVA - PAF-U3 Addition TOX PAF-FGD-A	KY	
5.02	1603	KKeheeran	D. Elledge	6.5°C	492	021015.03	CPIL - Asheville Ash Pond	NC	
6.02	1042	KKeheeran	Fed ex	0.2°C	493	021016.01	Duke Energy Corporation Lincoln CT Station	NC	
.02	1042	KKeheeran	Fed ex	0.7°C	494	021016.02	Duke Energy Corporation McGuire Nuclear Station	NC	

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: RONALD LOWERY

Environmental Testing Solutions, LLC
Research Building
1 Ecusta Road, Brevard, NC 28712
Phone: 828-862-8193
Fax: 828-862-8195

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

General Comments:

Field Identification / Sample Description	Grab/ Comp.	Ship Temp (°C)	Collection Date/Time Start	Collection Date/Time End	Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate) Y-	If Yes, Inches	No	Trace	Laboratory Use: Project number: 483 EST Log Number	Arrival Temp (°C)	By	Time	Appearance
	---	---	Begin 0640/0641		---	---									
SQN-101-TOX	comp	4	10/6/02 0740/0741	10/7/02 0640/0641	2(2.5g)		Yes	0.13			021008.04	0.3 °C	KEK	1059	CUSTODY SEALS INTACT
SQN-INT-TOX	comp	4	10/6/02 0656	10/7/02 0656	1 (2.5g)		Yes	0.13			021008.05	0.3 °C	KEK	1059	SAMPLES RECEIVED
															IN GOOD CONDITION

Sample Custody – Fill In From Top Down

Relinquished By (Signature).	Date/Time	Received By (Signature):	Date/Time
Ronald W. Lowery	10/7/02 / 1100	Fed Ex	10/7/02 / 1105
Fedex	10-08-02 1059	KEKeenan ETS	10-08-02 1059

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: RONALD LOWERY

Environmental Testing Solutions, LLC
Research Building
1 Ecusta Road, Brevard, NC 28712
Phone: 828-862-8193
Fax: 828-862-8195

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

General Comments:

Field Identification / Sample Description	Grab/ Comp	Ship Temp (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	---	---	Start	End	---	---	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	1049/1049 10/8/02	10/9/02 0949 0949	2(2.5g)		No				483 021010.02	0.8C	KEK	1052	CUSTODY SEALS INTACT
SQN-INT-TOX	comp	4	10/8/02 1109	10/9/02 1009	1 (2.5g)		No				483 021010.03	0.8C	KEK	1052	SAMPLES RECEIVED IN
															GOOD CONDITION

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Ronald W. Lowery	10/9/02 / 1100	Fed Ex	10/9/02 1200
Fedex	10-10-02 1052	KEKeenan ETS	10.10.02 1052

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: TVA SQN

P.O Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: 0026450

Collected By: RONALD LOWERY

Environmental Testing Solutions, LLC
Research Building
1 Ecusta Road, Brevard, NC 28712
Phone: 828-862-8193
Fax: 828-862-8195

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): _____

General Comments:

Field Identification / Sample Description	Grab/ Comp	Ship. Temp (°C)	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
	---	---	Start	End	---	---	Y-	If Yes, Inches	No	Trace	EST Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	comp	4	1329 10/10/02 1330	10/11/02 1229 1230	2(2.5g)		Y	0.94			483 021012.07	2.4°C	KEK	1105	CUSTODY SEALS INTACT
SQN-INT-TOX	comp	4	10/10/02 1342	10/11/02 1242	1 (2.5g)		Y	0.94			483 021012.08	2.4°C	KEK	1105	SAMPLES RECEIVED IN GOOD CONDITION

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Ronald W. Lowery	10/11/02 1345	Fed Ex ~~1515~~ 10/11/02	10/11/02 / 1515
Fedex	10-12-02 1105	KKeleenan ETS	10-12-02 1105

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The hold time for each sample is 36 hours from the time of collection. Therefore, please collect and ship in such a way that the laboratory will receive the samples with ample time to initiate testing within that time frame. Samples shipped overnight on Friday via FedEx or UPS must be marked for Saturday delivery or they will not arrive until the following Monday.

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002 Method 1000.0)
Species: *Pimephales promelas*

Client: TVA
Facility: SEQUOYAH NUCLEAR PLANT
NPDES #: TN-0026450

NONTREATED

Dilution preparation information:						*Comments:*
MHS batch:		10.09.02				
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	164.7	330	658.5	1080	1500	
Diluent volume (mL)	1335.3	1170	841.5	420	0	

Test organism information: 24.5 - 27.5		*Test information:*	
Organism age:	24 hours old	Randomizing template:	Blue
Date and times organisms were born between:	10-07-02 1030 TO 1330 HDT 1230 to 1530 EDT	Incubator number:	3
Organism source:	ABS BATCH 10-07-02	*Artemia* lot number:	BG18090
Transfer bowl information:	pH = 7.98 Temperature = 24.1°C	Oven temperature:	102°C
		Drying time:	19-Hours

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	10-08-02	——	1640	1559	JF
1	10-09-02	1027	1630	1555	JF
2	10-10-02	0953	1600	1552	KEK
3	10-11-02	1014	1631	1520	JF
4	10-12-02	1100	1700	1531	JF
5	10-13-02	0957	1600	1526	JF
6	10-14-02	1002	1615	1524	JF
7	10-15-02	——	——	1544	JF KEK

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC50	>100%
Average weight per larvae:	0.9403	≥ 0.25 mg/larvae	NOEC	100%
			LOEC	>100%
			ChV	>100%
			IC25	>100%

Species: *Pimephales promelas*

Client: TVA- Sequoyah NONTREATED

Date: 10-08-02

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	9'd	10	10	10	10	10	10	10	10
5	10	10	10	9	10	10	10	10	10	10	10	10
6	10	10	10	9	10	10	10	10	10	10	10	10
7	10	10	10	9	10	10	10	10	10	10	10	10
A = Pan weight (mg) PURGE	14.973	15.143	15.050	14.817	14.940	15.000	15.170	14.741	15.177	14.710	15.054	14.732
B = Pan + Larvae weight (mg)	24.79	25.02	23.68	24.11	24.21	25.19	23.62	24.43	24.76	23.75	24.05	23.93
Larvae weight (mg) = A – B	9.817	9.877	8.624	9.293	9.270	10.190	8.450	9.689	9.583	9.040	8.996	9.198

Calculations and data reviewed: JH

Comments:

Species: *Pimephales promelas*

Client: TVA- Sequoyah NONTREATED

Date: 10.08.02

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg)	14.908	14.860	14.648	14.855	14.942	14.886	14.665	15.071	14.925	14.819	15.193	14.665
B = Pan + Larvae weight (mg)	24.99	24.87	25.02	24.21	23.97	25.06	22.93	24.37	25.16	24.61	25.23	24.41
Larvae weight (mg) = A – B	10.082	10.004	10.372	9.355	9.028	10.174	8.265	9.299	10.235	9.791	10.037	9.745

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA- Seguoyan

NONTREATED

Date: 10.08.02

Survival and Growth Data

Day	Intake 100%			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg)	14.950	14.663	14.714	15.089
B = Pan + Larvae weight (mg)	25.48	25.56	25.12	24.37
Larvae weight (mg) = A – B	10.530	10.897	10.406	9.281

Calculations and data reviewed

Comments:

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)
Species: *Pimephales promelas*

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

Client: TVA Sequoyah Nuclear Plant, Nontreated
Test dates: October 8-15, 2002
Project number: 483

Revelwed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	14 973	24 790	9 817	0 9817	97.5	0 9403	6.2	Not applicable
	B	10	10	15 143	25 020	9 877	0 9877				
	C	10	10	15 056	23 680	8 624	0 8624				
	D	10	9	14 817	24 110	9 293	0 9293				
10 98%	E	10	10	14 940	24 210	9 270	0 9270	100 0	0 9400	7.8	0.0
	F	10	10	15 000	25 190	10 190	1 0190				
	G	10	10	15 170	23 620	8 450	0 8450				
	H	10	10	14 741	24.430	9 689	0 9689				
22%	I	10	10	15 177	24 760	9 583	0 9583	100 0	0.9204	2.9	2.1
	J	10	10	14 710	23.750	9 040	0 9040				
	K	10	10	15 054	24 050	8 996	0 8996				
	L	10	10	14 732	23 930	9.198	0 9198				
43.9%	M	10	10	14 908	24 990	10 082	1 0082	100 0	0.9953	4.3	-5.9
	N	10	10	14 866	24 870	10 004	1 0004				
	O	10	10	14 648	25 020	10.372	1 0372				
	P	10	10	14 855	24 210	9 355	0 9355				
72%	Q	10	10	14 942	23 970	9 028	0 9028	100 0	0.9192	8 6	2.2
	R	10	10	14 886	25 060	10 174	1 0174				
	S	10	10	14 665	22.930	8 265	0 8265				
	T	10	10	15 071	24 370	9 299	0 9299				
100%	U	10	10	14 925	25.160	10 235	1 0235	100 0	0 9952	2.3	-5.8
	V	10	10	14 819	24 610	9 791	0 9791				
	W	10	10	15 193	25 230	10 037	1 0037				
	X	10	10	14 665	24 410	9 745	0 9745				
100% Intake	Y	10	10	14 950	25 480	10 530	1 0530	100 0	1 0279	6.8	-9.3
	Z	10	10	14 663	25 560	10 897	1 0897				
	AA	10	10	14 714	25.120	10 406	1.0406				
	BB	10	10	15 089	24 370	9 281	0 9281				

Outfall 101:
Dunnett's MSD value: 0 0936
PMSD: 10 0

Intake:
Dunnett's MSD value: 0 0882
PMSD: 9 4

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19 6% from the control (determined through reference toxicant testing).

Lower PMSD bound determined by USEPA (10th percentile) = 9 4%
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests

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

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant
End Date:	10/15/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.9817	0.9877	0.8624	0.9293
10.98	0.9270	1.0190	0.8450	0.9689
22	0.9583	0.9040	0.8996	0.9198
43 9	1.0082	1.0004	1.0372	0.9355
72	0.9028	1.0174	0.8265	0.9299
100	1.0235	0.9791	1 0037	0.9745

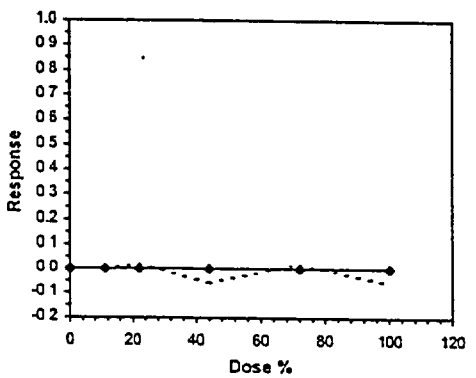
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0 9403	1.0000	0.9403	0.8624	0.9877	6.186	4				0.9517	1.0000
10 98	0.9400	0.9997	0.9400	0.8450	1.0190	7.835	4	0.008	2.410	0 0936	0.9517	1.0000
22	0 9204	0.9789	0.9204	0.8996	0.9583	2.901	4	0.511	2.410	0.0936	0.9517	1 0000
43 9	0 9953	1 0585	0.9953	0.9355	1.0372	4.311	4	-1 418	2.410	0 0936	0 9517	1 0000
72	0 9192	0.9775	0.9192	0.8265	1.0174	8.571	4	0.544	2.410	0.0936	0 9517	1 0000
100	0 9952	1 0584	0.9952	0.9745	1.0235	2.292	4	-1 415	2.410	0 0936	0 9517	1 0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0.959660053	0.884	-0.237724829	0.135401943
Bartlett's Test indicates equal variances (p = 0.30)	6 020889282	15 08631706		

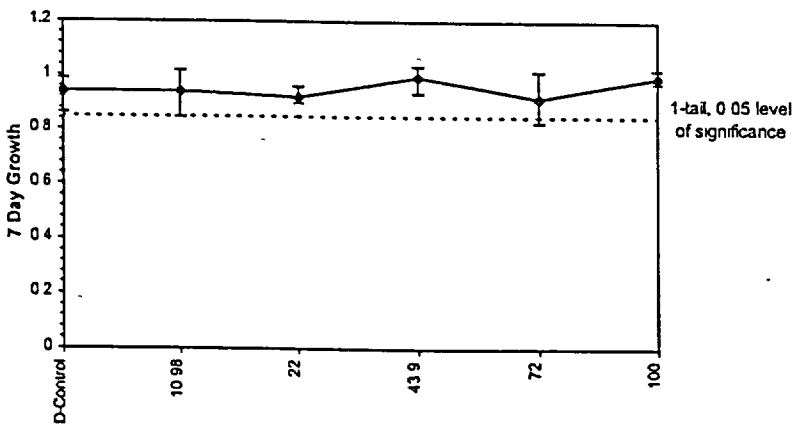
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.093566423	0 099509636	0 004880817	0 003014643	0.205624431	5, 18

Linear Interpolation (80 Resamples)

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



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID	PpFRCR	Sample ID	TVA, Sequoyah Nuclear Plant - Intake
End Date	10/15/02	Lab ID	ETS-Env Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date		Protocol	EPAF 91-EPA Freshwater	Test Species	PP-Pimephales promelas
Comments					

Conc-%	1	2	3	4
D-Control	0.9817	0 9877	0 8624	0 9293
100	1.0530	1 0897	1.0406	0 9281

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0 9403	1.0000	0 9403	0 8624	0 9877	6 186	4			
100	1 0279	1.0931	1 0279	0 9281	1 0897	6 780	4	-1 929	1 943	0 0882

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 877389908	0 749	-0 938263685	-0 532798057
F-Test indicates equal variances (p = 0 77)	1 435506105	47 46834564		

Hypothesis Test (1-tail, 0 05)

Homoscedastic t Test indicates no significant differences

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002 Method 1002.0)

Species: *Ceriodaphnia dubia*

	Date	Time	Analyst
Test start	10.08.02	1219	JL
Test end	10-14-02	1159	JL

Client: TVA- Sequoyah nuclear Plant
Facility:
NPDES #: TN-0026450

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	164.7	330	658.5	1080	1500	
Diluent volume (mL)	1385.3	1170	841.5	420	0	

Test organism information:		*Test information:*	
Organism age:	<24 hours old	Randomizing template:	Yellow
Date and times organisms were born between:	10-07-02 1519 to 1809	Incubator number:	2
Organism source:	10-01-02 A&B	YCT batch: ABS	10.01.02
Transfer bowl information:	pH = 8.09 Temperature = 25.1	*Selenastrum* batch: ABS	10.01.02

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	5	4	4	4	3	4	3	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	10	8	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	0	10	8	10	11	11	10	8	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	13	16	1*	17	14	16	15	17	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	~~14~~ JL	—	—	—	—	—	JL
Total young produced		32	~~3~~ 25 JL	30	13	30	29	30	29	28	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X		X	X	X	X	X	X

* carry over

Calculations and data reviewed: JL

Test Renewal, Feeding, and Incubator Location Information

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	10-14	10-08	10-09	10-10	10-11	10-12	10-13
Time	1159	1219	1239	1300	1316	1302	1227
Analyst	JL	JL	JL	KEK	JL	JL	JL
Shelf Location	CL	CL	CL	CL	CL	CL	CL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	90%	≥ 80%	NOEC	100%
% Mortality:	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	27.4	≥ 15.0 offspring/female	ChV	>100%
% CV:	19.6%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*

Client: TVA - Sequoyah **Date:** 10.08.02

CONCENTRATION: 10.98%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	3	4	4	3	3	4	4	4	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	1*	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	12	11	9	10	10	10	8	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	15	16	16	13	17	0	15	18	17	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced										
Total young produced		31	32	31	25	30	15	29	30	31	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.6
% Reduction from Control:	-4.4%

Calculations and data reviewed: JH

CONCENTRATION: 22%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	4	4	4	4	5	5	5	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	1*	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	10	9	10	10	12	10	10	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	19	17	17	14	13	20	18	18	15	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced										
Total young produced		36	31	30	29	27	37	33	33	29	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.6
% Reduction from Control:	-15.3%

Calculations and data reviewed: JH

Species: *Ceriodaphnia dubia*

Client: TVA. Sequoyah **Date:** 10.08.02

CONCENTRATION: 43.9%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	3	4	4	4	4	6	3	4	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	0	1*	10	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	10	10	11	12	14	12	1*	10	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	15	16	19	14	19	18	20	16	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	—	—	—	—	—	—	—
Total young produced		32	29	30	34	30	39	34	35	30	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.3
% Reduction from Control:	-17.9%

Calculations and data reviewed: JH

CONCENTRATION: 72%

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	3	4	6	4	4	4	3	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	11	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	0	13	13	14	10	13	12	12	10	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	18	16	19	18	17	20	18	18	15	20
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	—	—	—	—	—	—	—	—	—	—
Total young produced		33	32	36	38	31	37	34	33	30	37
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.1
% Reduction from Control:	-24.5%

Calculations and data reviewed: JH

Species: *Ceriodaphnia dubia*

Client: TVA - Sequoyah Date: 10.08.02

CONCENTRATION: 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	5	4	5	3	4	3	4	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	10	0	13	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	14	13	14	14	1*	16	0	14	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	17	18	18	16	21	21	0	20	19	20
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced										
Total young produced		34	36	36	33	39	35	20	37	37	41
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

* carry over

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.8
% Reduction from Control:	-27.0%

Calculations and data reviewed: [illegible]

CONCENTRATION: Intake 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	4	4	4	5	3	5	4	4	5	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	2	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	16	12	12	15	10	10	8	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	15	10	15	12	0	19	0	15	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced										
Total young produced		32	30	30	32	27	20	33	14	28	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	27.4
% Reduction from Control:	0%

Calculations and data reviewed: [illegible]

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)

Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant, UV Treated

Test dates: October 8-14, 2002

Project number: 483

Reviewed by:

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15 187	27 190	12 003	1 2003	100 0	1.1346	8.7	Not applicable
	B	10	10	14 964	26 910	11 946	1.1946				
	C	10	10	14 945	26 480	11 535	1.1535				
	D	10	10	14 871	24 770	9 899	0 9899				
10 98%	E	10	10	14 873	24 690	9 817	0 9817	97.5	0.9840	1.9	13.3
	F	10	9	15 106	25 110	10 004	1 0004				
	G	10	10	14 922	24 870	9 948	0 9948				
	H	10	10	15 008	24 600	9 592	0 9592				
22%	I	10	10	15 145	26 630	11 485	1 1485	97.5	1.0454	14.0	7.9
	J	10	10	15 063	26 620	11 557	1 1557				
	K	10	10	15 162	25 510	10 348	1 0348				
	L	10	9	15 175	23 600	8 425	0 8425				
43 9%	M	10	10	15 051	26 960	11 909	1 1909	100 0	1.1023	6.2	2.8
	N	10	10	14 976	25 880	10 904	1 0904				
	O	10	10	15 156	25 410	10 254	1 0254				
	P	10	10	15 076	26 100	11 024	1 1024				
72%	Q	10	10	15 182	26 910	11.728	1 1728	100 0	1 0848	11.0	4.4
	R	10	10	14 992	25 330	10 338	1 0338				
	S	10	10	15 073	24 470	9 397	0 9397				
	T	10	10	14 980	26 910	11 930	1.1930				
100%	U	10	10	14 647	26 150	11 503	1.1503	100 0	1.1555	7.0	-1.8
	V	10	10	15 185	25 990	10 805	1 0805				
	W	10	10	15 152	27 850	12 698	1 2698				
	X	10	10	14 645	25 860	11 215	1.1215				
100% Intake	Y	10	10	14 760	26 610	11 850	1 1850	100.0	1.0960	6.4	3.4
	Z	10	10	15 019	26 190	11 171	1.1171				
	AA	10	10	15 193	25.710	10 517	1 0517				
	BB	10	10	15 120	25 420	10 300	1 0300				

Outfall 101:
Dunnett's MSD value: 0 1662
PMSD: 14 6

Intake:
Dunnett's MSD value: 0 1175
PMSD: 10 4

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19 6% from the control (determined through
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests

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

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)
Species: Ceriodaphnia dubia

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

lient: TVA Sequoyah Nuclear Plant, Nontreated

est dates: October 8-14, 2002

roject number: 483

Revelwed by: [signature]

Concentration (%)	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	32	25	30	13	30	29	30	29	28	28	100	27.4	19.6	Not applicable
10.98%	31	32	31	25	30	15	29	30	31	32	100	28.6	18.1	-4.4
22%	36	31	30	29	27	37	33	33	29	31	100	31.6	10.0	-15.3
43.9%	32	29	30	34	30	39	34	35	30	30	100	32.3	9.8	-17.9
72%	33	32	36	38	31	37	34	33	30	37	100	34.1	8.1	-24.5
100%	34	36	36	33	39	35	20	37	37	41	100	34.8	16.4	-27.0
100% Intake	32	30	30	32	27	20	33	14	28	28	100	27.4	21.8	0.0

tfall 101:
nnett's MSD value: 4.496
ISD: 16.4

ake:
nnett's MSD value: 4.413
ISD: 16.1

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 11.8% from the control.

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

Upper PMSD bound determined by USEPA (90th percentile) = 37%.
The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

EPA. 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 ›tection Agency, Cincinnati, OH.

Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/8/02	Test ID	CdFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant
End Date:	10/14/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol.	EPAF 91-EPA Freshwater	Test Species.	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	32.000	25.000	30 000	13.000	30.000	29 000	30.000	29.000	28 000	28.000
10.98	31 000	32.000	31 000	25.000	30.000	15 000	29 000	30.000	31.000	32.000
22	36 000	31.000	30 000	29.000	27.000	37 000	33 000	33.000	29.000	31.000
43.9	32.000	29.000	30 000	34 000	30 000	39 000	34 000	35.000	30.000	30.000
72	33 000	32.000	36.000	38 000	31.000	37.000	34 000	33.000	30 000	37.000
100	34.000	36.000	36.000	33.000	39.000	35.000	20 000	37.000	37.000	41 000

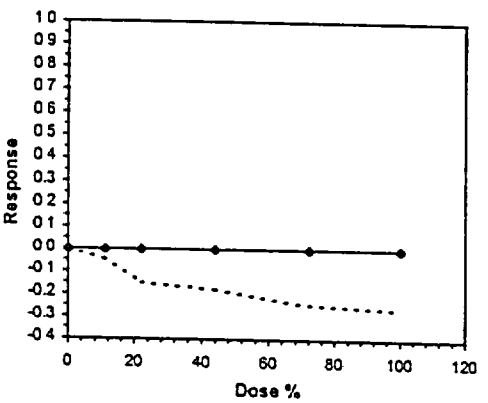
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	27 400	1.0000	27 400	13 000	32.000	19 631	10			31 467	1.0000
10 98	28 600	1.0438	28 600	15 000	32.000	18.146	10	123.50	75 00	31 467	1 0000
22	31 600	1.1533	31 600	27.000	37 000	10 029	10	132.50	75 00	31 467	1 0000
43 9	32.300	1.1788	32.300	29 000	39 000	9 796	10	139.50	75 00	31 467	1 0000
72	34 100	1.2445	34 100	30 000	38 000	8 114	10	151.00	75 00	31 467	1 0000
100	34 800	1.2701	34 800	20 000	41 000	16.357	10	146 00	75 00	31 467	1 0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0 01)	1.058434725	1.035	-1.84435828	4.819992863
Bartlett's Test indicates equal variances (p = 0 13)	8.516535759	15 08631706		

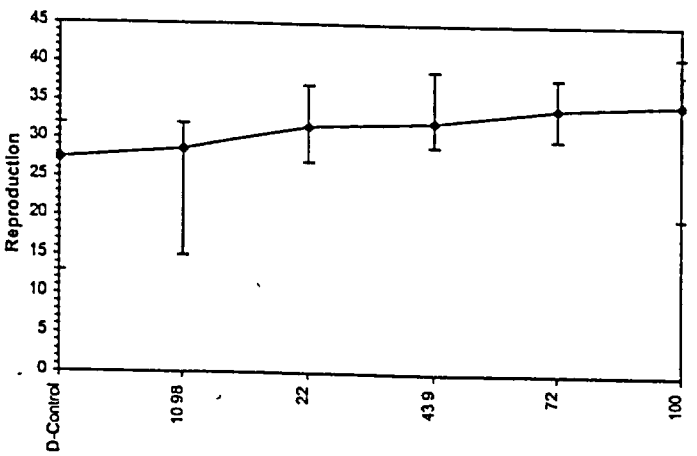
Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Linear Interpolation (80 Resamples)

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



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Used for PMSD calculation only.			Ceriodaphnia Survival and Reproduction Test-Reproduction		
Start Date.	10/8/02	Test ID:	CdFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant
End Date	10/14/02	Lab ID:	ETS-Env Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date		Protocol	EPAF 91-EPA Freshwater	Test Species	CD-Ceriodaphnia dubia
Comments					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	32.000	25.000	30 000	13 000	30 000	29 000	30 000	29 000	28.000	28 000
10 98	31 000	32.000	31 000	25 000	30 000	15 000	29.000	30 000	31.000	32.000
22	36 000	31 000	30 000	29 000	27 000	37 000	33 000	33.000	29 000	31.000
43 9	32.000	29 000	30 000	34 000	30 000	39 000	34 000	35.000	30.000	30 000
72	33 000	32 000	36.000	38 000	31 000	37 000	34 000	33.000	30.000	37.000
100	34 000	36 000	36.000	33 000	39 000	35 000	20 000	37.000	37.000	41.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	27 400	1 0000	27 400	13.000	32 000	19 631	10			
10 98	28 600	1 0438	28 600	15.000	32 000	18 146	10	-0 610	2 287	4 496
22	31.600	1 1533	31 600	27.000	37 000	10.029	10	-2.136	2 287	4 496
43 9	32.300	1.1788	32.300	29 000	39 000	9 796	10	-2 492	2.287	4 496
72	34 100	1.2445	34 100	30 000	38 000	8 114	10	-3 408	2.287	4 496
100	34 800	1.2701	34 800	20 000	41 000	16.357	10	-3 764	2.287	4 496

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution (p <= 0 01)	1.058434725	1.035	-1 844358283	4 819992863
Bartlett's Test indicates equal variances (p = 0 13)	8.516535759	15.08631706		

Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	4 496034328	0 164088844	87 02666667	19.32962963	0 001676433	5, 54

Environmental Testing Solutions, LLC

Statistical Analyses

Used for PMSD calculation only					
		Ceriodaphnia Survival and Reproduction Test-Reproduction			
Start Date	10/8/02	Test ID	CdFRCR	Sample ID	TVA, Sequoyah Nuclear Plant - Intake
End Date	10/14/02	Lab ID:	ETS-Env Testing Solutions	Sample Type	DMR-Discharge Monitoring Report
Sample Date:		Protocol	EPAF 91-EPA Freshwater	Test Species	CD-Ceriodaphnia dubia
Comments					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	32.000	25 000	30 000	13 000	30 000	29 000	30 000	29 000	28 000	28 000
100	32 000	30 000	30 000	32.000	27 000	20 000	33 000	14 000	28 000	28 000

			Transform Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	27 400	1 0000	27 400	13 000	32.000	19 631	10			
100	27 400	1 0000	27 400	14 000	33 000	21.844	10	0 000	1.734	4 413

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0 01)	0 755762458	0 868	-1 806076918	2.667645544
F-Test indicates equal variances (p = 0.76)	1 238095284	6.54108572		
Hypothesis Test (1-tail, 0 05)				
Homoscedastic t Test indicates no significant differences				

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002 Method 1000.0)
Species: *Pimephales promelas*

Client: TVA
Facility: Sequoyah - UV Treated
NPDES #: TN-0026450

Dilution preparation information:						*Comments:*
MHS batch:		10.0702				
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	~~104.7~~	220	439	720	1000	
Diluent volume (mL)	109.8 ~~890.2~~	780	561	280	0	

Test organism information: 24.5 to 27.5		*Test information:*	
Organism age:	24 HOURS OLD	Randomizing template:	RED
Date and times organisms were born between:	10-07-02 1030 TO 1330 MDT 1230 to 1530 EDT	Incubator number:	3
Organism source:	ABS BATCH 10-07-02	*Artemia* lot number:	~~BG~~ 1809Q
Transfer bowl information:	pH = 7.98 Temperature = 24.1°C	Oven temperature:	102°C
		Drying time:	9-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	10-08-02	—— JP	1610	1559	JP
1	10-09-02	1027	1630	1540	JP
2	10-10-02	0953	1600	1536	KEK
3	10-11-02	1014	1631	1507	JP
4	10-12-02	1100	1700	1516	JP
5	10-13-02	0957	1600	1510	JP
6	10-14-02	1002	1615	1507	JP
7	10-15-02	——	JP	1609	KEK

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC50	>100%
Average weight per larvae:	1.1346	≥ 0.25 mg/larvae	NOEC	100%
			LOEC	>100%
			ChV	>100%
			IC25	>100%

Species: *Pimephales promelas*

Client: ~~TA~~ TVA - Sequoyah
UV - Treated

Date: 10.08.02

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	9 id	10	10	10	10	10	10
3	10	10	10	10	10	9	10	10	10	10	10	10
4	10	10	10	10	10	9	10	10	10	10	10	9 id
5	10	10	10	10	10	9	10	10	10	10	10	9
6	10	10	10	10	10	9	10	10	10	10	10	9
7	10	10	10	10	10	9	10	10	10	10	10	9
A = Pan weight (mg) BLACK	15.187	14.964	14.945	14.871	14.873	15.106	14.922	15.008	15.145	15.063	15.162	15.175
B = Pan + Larvae weight (mg)	27.19	26.91	26.48	24.77	24.69	25.11	24.87	24.60	26.63	26.62	25.51	23.60
Larvae weight (mg) = A – B	12.003	11.946	11.535	9.899	9.817	10.004	9.948	9.592	11.485	11.557	10.348	8.425

Calculations and data reviewed: JH

Comments:

Species: *Pimephales promelas*

Client: TVA - Sequoyah
UV-Treated

Date: 10-08-02

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg)	15.051	14.976	15.156	15.076	15.182	14.992	15.073	14.980	14.647	15.185	15.152	14.645
B = Pan + Larvae weight (mg)	26.96	25.88	25.41	26.10	26.91	25.33	24.47	26.91	26.15	25.99	27.85	25.86
Larvae weight (mg) = A – B	11.909	10.904	10.254	11.024	11.728	10.338	9.397	11.930	11.503	10.805	12.698	11.215

Calculations and data reviewed: JF

Comments:

Species: ***Pimephales promelas***

Client: TVA - Sequoyah UV-Treated

Date: 10.08.02

Survival and Growth Data

Day	Totake 100%			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	10	10	10	10
A = Pan weight (mg)	14.760	15.019	15.193	15.120
B = Pan + Larvae weight (mg)	26.61	26.19	25.71	25.42
Larvae weight (mg) = A – B	11.850	11.171	10.517	10.300

Calculations and data reviewed: [illegible]

Comments:

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)

Species: *Pimephales promelas*

Quality Control

Verification of Data Entry, Calculations, and Statistical Analyses

Client: TVA Sequoyah Nuclear Plant, UV Treated

Test dates: October 8-14, 2002

Project number: 483

Reviewed by: [signature]

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15 187	27.190	12 003	1 2003	100 0	1.1346	8.7	Not applicable
	B	10	10	14 964	26 910	11 946	1 1946				
	C	10	10	14 945	26 480	11 535	1 1535				
	D	10	10	14 871	24 770	9 899	0 9899				
10.98%	E	10	10	14 873	24 690	9 817	0 9817	97.5	0.9840	1.9	13.3
	F	10	9	15 106	25 110	10 004	1 0004				
	G	10	10	14 922	24 870	9 948	0 9948				
	H	10	10	15 008	24 600	9 592	0 9592				
22%	I	10	10	15 145	26 630	11 485	1.1485	97.5	1.0454	14.0	7.9
	J	10	10	15 063	26 620	11 557	1.1557				
	K	10	10	15 162	25 510	10 348	1 0348				
	L	10	9	15 175	23 600	8 425	0 8425				
43.9%	M	10	10	15 051	26 960	11 909	1 1909	100 0	1.1023	6.2	2.8
	N	10	10	14 976	25 880	10 904	1 0904				
	O	10	10	15 156	25 410	10 254	1 0254				
	P	10	10	15 076	26 100	11 024	1.1024				
72%	Q	10	10	15 182	26 910	11.728	1.1728	100 0	1.0848	11.0	4.4
	R	10	10	14 992	25 330	10 338	1 0338				
	S	10	10	15 073	24 470	9 397	0 9397				
	T	10	10	14 980	26 910	11.930	1 1930				
100%	U	10	10	14 647	26 150	11 503	1 1503	100 0	1.1555	7 0	-1.8
	V	10	10	15 185	25 990	10 805	1 0805				
	W	10	10	15 152	27 850	12 698	1 2698				
	X	10	10	14 645	25 860	11 215	1.1215				
100% Intake	Y	10	10	14 760	26 610	11 850	1.1850	100 0	1.0960	6.4	3.4
	Z	10	10	15 019	26 190	11.171	1 1171				
	AA	10	10	15 193	25 710	10 517	1 0517				
	BB	10	10	15 120	25 420	10 300	1 0300				

Outfall 101:

Dunnett's MSD value: 0.1662

PMSD: 14.6

Intake:

Dunnett's MSD value: 0.1175

PMSD: 10.4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19 6% from the control (determined through

Lower PMSD bound determined by USEPA (10th percentile) = 9 4%

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

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

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

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	PpFRCR	Sample ID:	TVA, Sequoyah Nuclear Plant
End Date:	10/15/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments	UV-Treated				

Conc-%	1	2	3	4
D-Control	1.2003	1.1946	1.1535	0.9899
10.98	0.9817	1.0004	0.9948	0.9592
22	1.1485	1.1557	1.0348	0.8425
43.9	1.1909	1.0904	1.0254	1.1024
72	1.1728	1.0338	0.9397	1.1930
100	1.1503	1.0805	1.2698	1.1215

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	1.1346	1.0000	1.1346	0.9899	1.2003	8.697	4				1.1346	1.0000
10.98	0.9840	0.8673	0.9840	0.9592	1.0004	1.861	4	2.183	2.410	0.1662	1.0744	0.9470
22	1.0454	0.9214	1.0454	0.8425	1.1557	13.980	4	1.294	2.410	0.1662	1.0744	0.9470
43.9	1.1023	0.9715	1.1023	1.0254	1.1909	6.176	4	0.468	2.410	0.1662	1.0744	0.9470
72	1.0848	0.9562	1.0848	0.9397	1.1930	11.050	4	0.721	2.410	0.1662	1.0744	0.9470
100	1.1555	1.0185	1.1555	1.0805	1.2698	7.043	4	-0.304	2.410	0.1662	1.0744	0.9470

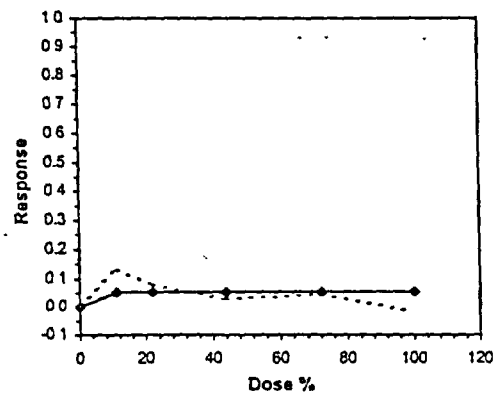
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.937664628	0.884	-0.62160028	0.003317631
Bartlett's Test indicates equal variances (p = 0.13)	8.444832802	15.08631706		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.16618429	0.146472723	0.015595262	0.009509897	0.200275555	5, 18

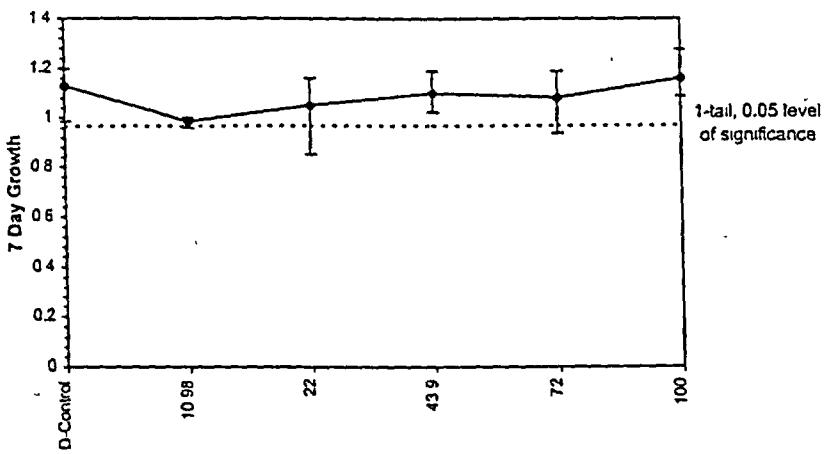
Linear Interpolation (30 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	10.352			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth					
Start Date	10/8/02	Test ID	PpFRCR	Sample ID	TVA, Sequoyah Nuclear Plant - Intake
End Date:	10/15/02	Lab ID:	ETS-Env Testing Solutions	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol.	EPAF 91-EPA Freshwater	Test Species	PP-Pimephales promelas
Comments	UV-Treated				

Conc-%	1	2	3	4
D-Control	1.2003	1 1946	1 1535	0 9899
100	1.1850	1 1171	1.0517	1 0300

			Transform. Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	1.1346	1.0000	1.1346	0 9899	1.2003	8.697	4			
100	1 0960	0 9660	1.0960	1 0300	1 1850	6 384	4	0 639	1.943	0 1175

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0 01)	0 924149632	0 749	-0 83582504	-0.054987614
F-Test indicates equal variances (p = 0.59)	1 989268303	47 46834564		

Hypothesis Test (1-tail, 0 05)

Homoscedastic t Test indicates no significant differences

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)
Species: *Pimephales promelas*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: October 08-15, 2002

Project number: 483

Reviewed by: Cw

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7 82	7.32	7 71	7.25	7 92	7.58	7 97	7 42	7 87	7.50	7.84	7.79	7 96	7.74
	DO (mg/L)	7.8	7.1	8 1	6.9	8 4	7.2	8 1	6 9	7.8	6.9	7 8	7 6	7.9	7.7
	Conductivity (µmhos/cm)	294		302		314		312		301		304		314	
	Alkalinity (mg/L $CaCO_3$)	61								62				60	
	Hardness (mg/L $CaCO_3$)	82								86				82	
	Temperature (°C)	24 4	24.8	24 2	25.0	24 6	24 9	24 6	25 3	24 3	25 0	24.7	24 8	24 6	25.3
10.98%	pH (SU)	7 84	7.31	7.83	7.20	7.86	7.41	7 94	7.36	7.90	7.40	7.89	7.78	7.82	7.70
	DO (mg/L)	7.8	7.1	8 2	6 9	8.2	7.2	8 0	6 9	8 0	6.9	7.8	7.7	8 0	7.7
	Conductivity (µmhos/cm)	283		288		301		294		290		293		302	
	Temperature (°C)	24 4	24 8	24 5	25 0	24 5	24.9	24 7	25 3	24 4	25.0	24.7	24 8	24.7	25.3
22%	pH (SU)	7 83	7.33	7 82	7.24	7 84	7.40	7.93	7 33	7 87	7.43	7.87	7.74	7 83	7 69
	DO (mg/L)	7 8	7 0	8 2	6 8	8 2	6 7	8 1	6.8	8.0	6 6	7.9	7.7	8 0	7.7
	Conductivity (µmhos/cm)	270		271		286		284		277		284		288	
	Temperature (°C)	24.6	24 8	24.5	25 0	24.5	24 9	24 7	25.3	24 4	25.0	24 7	24 8	24 8	25 3
43.9%	pH (SU)	7 80	7.33	7 80	7 17	7 81	7.36	7.90	7.32	7 83	7.40	7.82	7.76	7.83	7.72
	DO (mg/L)	7 9	7.0	8 2	6 8	8 3	6 5	8.1	6.9	8 0	6 5	7 9	7.7	8 0	7.7
	Conductivity (µmhos/cm)	248		247		261		259		254		256		263	
	Temperature (°C)	24 6	24.8	24.7	25.0	24.7	24 9	24.7	25.3	24.5	25 0	24.7	24.8	24 8	25.3
72%	pH (SU)	7.62	7.32	7.76	7 21	7.76	7.38	7 85	7 30	7.78	7.35	7.77	7.73	7.80	7.70
	DO (mg/L)	7.9	7.1	8 2	6.8	8 3	6.5	8 1	6.7	8 0	6 5	7.9	7.6	8.1	7.7
	Conductivity (µmhos/cm)	214		215		224		222		220		222		226	
	Temperature (°C)	24 7	24 8	24 9	25 0	24 7	24 9	24.7	25 3	24 5	25 0	24.7	24.8	24 8	25.3
100%	pH (SU)	7.70	7 28	7.74	7.19	7.72	7 34	7 90	7.30	7 68	7.36	7.66	7.74	7.78	7.71
	DO (mg/L)	8 0	7.2	8 2	6 9	8 3	6 4	8 1	6 9	8 1	6 4	7.9	7.6	8.1	7.8
	Conductivity (µmhos/cm)	182		183		192		191		187		188		191	
	Alkalinity (mg/L $CaCO_3$)	61				63				62					
	Hardness (mg/L $CaCO_3$)	72				74				100					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25 0	24 8	25 0	25 0	24.7	24.9	24.7	25.3	24.5	25.0	24 8	24 8	24 8	25.3
100% Intake	pH (SU)	7.74	7.37	7 73	7.21	7 42	7.38	7.84	7.34	7.60	7.36	7.65	7.39	7.72	7.81
	DO (mg/L)	8.2	7 2	8.3	6.7	8.4	7.2	8 0	6.9	8.1	6.4	8 0	8.0	8.1	8.0
	Conductivity (µmhos/cm)	181		181		195		190		183		185		188	
	Alkalinity (mg/L $CaCO_3$)	62				62				57					
	Hardness (mg/L $CaCO_3$)	86				80				82					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25 2	24.8	24 9	25.0	24 6	24 9	24.7	25 3	24 4	25 0	24.7	24 8	24 6	25.3

Species: ***Ceriodaphnia dubia***

Client: TVA - Sequoyah

Date: 10.08.02

Full-strength Chemistry: Outfall 101

Parameter	Sample Number:			Control Batch:		
	1	2	3	10.07.02	10-09-02	10-11-02
pH (S.U.)	7.70	7.72	7.68	7.82	7.87	7.96
DO (mg/L)	8.0	8.3	8.1	7.8	7.8	7.9
Conductivity (µmhos/cm)	182	192	187	294	301	314
Alkalinity (mg $CaCO_3$/L)	61	63	62	61	62	60
Hardness (mg $CaCO_3$/L)	72	74	100	82	86	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	10-06-02	10-08-02	10-10-02			
Collection end time	0641	0949	1230			
Grab or Composite (duration)	~~25~~ 24 hr COMP	~~25~~ 24 HOUR COMPOSITE	~~25~~ 24 HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3 °C	0.8 °C	2.4 °C			
Physical characteristics	pale tan, Clear	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	10.08.02 10.09.02	10.10.02 10.11.02	10.12.02 10.13.02 10.14.02			
ETS Project and Sample numbers	483 021003.04	021010.03	021012.07			

Species: *Ceriodaphnia dubia*

Client: TVA - Sequoyah

Date: 10.08.02

Full-strength Chemistry: Intake

Parameter	Sample Number:			Control Batch:		
	1	2	3	10.09.02	10-09-02	10-11-02
pH (S.U.)	7.74	7.42	7.60	7.82	7.87	7.96
DO (mg/L)	8.2	8.4	8.1	7.8	7.8	7.9
Conductivity (µmhos/cm)	181	195	183	294	301	314
Alkalinity (mg $CaCO_3$/L)	62	62	57	61	62	60
Hardness (mg $CaCO_3$/L)	86	80	82	82	86	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	10.06.02	10-08-02	10-10-02			
Collection end time	0656	1009	1242			
Grab or Composite (duration)	~~23~~ 24 hour comp	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.8°C	2.4°C			
Physical characteristics	pale tan, Clear	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	10.08.02 10.09.02	10.10.02 10.11.02	10.12.02 10.13.02 10.14.02			
ETS Project and Sample numbers	483 021008.05	021010.03	021012.08			

Species: *Ceriodaphnia dubia*

Client: TVA - Sequoyah

Date: 10.08.02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	7.82	7.82	7.71	7.89	7.92	8.00
	DO (mg/L)	7.8	8.2	8.1	8.4	8.4	8.1
	Conductivity (µmhos/cm)	294		302		314	
	Temperature (°C)	24.4	24.9	24.3	25.3	24.5	25.0
10.98 %	pH (S.U.)	7.84	7.75	7.83	7.87	7.86	8.02
	DO (mg/L)	7.8	8.0	8.2	8.4	8.2	8.1
	Conductivity (µmhos/cm)	283		288		301	
	Temperature (°C)	24.5	24.9	24.4	25.3	24.6	25.0
22 %	pH (S.U.)	7.83	7.76	7.82	7.89	7.84	8.00
	DO (mg/L)	7.8	8.0	8.2	8.4	8.2	8.1
	Conductivity (µmhos/cm)	270		271		286	
	Temperature (°C)	24.7	24.9	24.4	25.3	24.6	25.0
43.9 %	pH (S.U.)	7.80	7.74	7.80	7.90	~~7.84~~	8.02
	DO (mg/L)	7.9	8.0	8.2	8.4	7.81 8.3	8.2
	Conductivity (µmhos/cm)	248		247		261	
	Temperature (°C)	24.7	24.9	24.6	25.3	24.7	25.0
72 %	pH (S.U.)	7.62	7.71	7.76	7.91	7.76	8.00
	DO (mg/L)	7.9	8.0	8.2	8.4	8.3	8.2
	Conductivity (µmhos/cm)	214		215		224	
	Temperature (°C)	24.9	24.9	24.7	25.3	24.8	25.0
100 %	pH (S.U.)	7.70	7.76	7.74	7.87	7.72	7.97
	DO (mg/L)	8.0	8.0	8.2	8.5	8.3	8.2
	Conductivity (µmhos/cm)	182		183		192	
	Temperature (°C)	25.3	24.9	24.9	25.3	24.8	25.0
Intake 100 %	pH (S.U.)	7.74	7.75	7.73	7.86	7.42	7.91
	DO (mg/L)	8.2	8.3	8.3	8.4	8.4	8.1
	Conductivity (µmhos/cm)	181		181		195	
	Temperature (°C)	25.2	24.9	24.8	25.3	24.7	25.0
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

Client: TVA - Sequoyah

Date: 10.08.02

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	7.97	8.00	7.87	7.91	7.84	8.05	7.96	
	DO (mg/L)	8.1	8.3	7.8	7.7	7.8	8.0	7.9	
	Conductivity (µmhos/cm)	312		301		304		314	
	Temperature (°C)	24.5	25.2	24.5	24.9	24.6	25.0	24.6	
18.98%	pH (S.U.)	7.94	8.07	7.90	7.92	7.89	8.10	7.82	
	DO (mg/L)	8.0	8.3	8.0	7.7	7.8	8.1	8.0	
	Conductivity (µmhos/cm)	294		290		293		302	
	Temperature (°C)	24.7	25.2	24.5	24.9	24.6	25.0	24.6	
22%	pH (S.U.)	7.93	8.06	7.87	7.91	7.87	8.11	7.83	
	DO (mg/L)	8.1	8.3	8.0	7.8	7.9	8.2	8.0	
	Conductivity (µmhos/cm)	284		277		284		288	
	Temperature (°C)	24.7	25.2	24.5	24.9	24.6	25.0	24.8	
43.9%	pH (S.U.)	7.90	8.05	7.83	7.91	7.82	8.15	7.83	
	DO (mg/L)	8.1	8.3	8.0	7.9	7.9	8.3	8.0	
	Conductivity (µmhos/cm)	259		254		256		263	
	Temperature (°C)	24.7	25.2	24.5	24.9	24.6	25.0	25.1	
92%	pH (S.U.)	7.85	8.05	7.78	7.94	7.77	8.13	7.80	
	DO (mg/L)	8.1	8.4	8.0	7.9	7.9	8.4	8.1	
	Conductivity (µmhos/cm)	222		220		222		226	
	Temperature (°C)	24.7	25.2	24.6	24.9	24.7	25.0	25.3	
100%	pH (S.U.)	7.90	8.03	7.68	7.89	7.66	8.10	7.78	
	DO (mg/L)	8.1	8.4	8.1	8.1	7.9	8.4	8.1	
	Conductivity (µmhos/cm)	191		187		188		191	
	Temperature (°C)	24.7	25.2	24.6	24.9	24.7	25.0	25.5	
Intake 100%	pH (S.U.)	7.84	7.96	7.60	7.87	7.65	8.07	7.72	
	DO (mg/L)	8.0	8.0	8.1	8.0	8.0	8.1	8.1	
	Conductivity (µmhos/cm)	190		183		185		188	
	Temperature (°C)	24.7	25.2	24.6	24.9	24.7	25.0	25.1	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)
Species: *Ceriodaphnia dubia*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: October 08-15, 2002

Project number: 483

Reviewed by: Cr

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7 82	7 82	7.71	7 89	7 92	8 00	7 97	8 00	7 87	7 91	7.84	8 05		
	DO (mg/L)	7 8	8 2	8 1	8 4	8.4	8.1	8 1	8 3	7.8	7.7	7.8	8 0		
	Conductivity (µmhos/cm)	294		302		314		312		301		304			
	Alkalinity (mg/L $CaCO_3$)	61								62					
	Hardness (mg/L $CaCO_3$)	82								86					
	Temperature (°C)	24 4	24 9	24.3	25.3	24.5	25.0	24.5	25.2	24.5	24.9	24 6	25.0		
10.98%	pH (SU)	7 84	7.75	7 83	7.87	7 86	8 02	7.94	8 07	7.90	7.92	7.89	8.10		
	DO (mg/L)	7 8	8 0	8 2	8 4	8 2	8 1	8 0	8 3	8 0	7.7	7 8	8.1		
	Conductivity (µmhos/cm)	283		288		301		294		290		293			
	Temperature (°C)	24 5	24 9	24 4	25.3	24 6	25 0	24.7	25 2	24 5	24 9	24 6	25 0		
22%	pH (SU)	7 83	7 76	7 82	7 89	7 84	8 00	7.93	8 06	7 87	7 91	7 87	8 11		
	DO (mg/L)	7 8	8 0	8 2	8 4	8 2	8.1	8 1	8 3	8 0	7 8	7.9	8 2		
	Conductivity (µmhos/cm)	270		271		286		284		277		284			
	Temperature (°C)	24 7	24 9	24 4	25.3	24 6	25 0	24.7	25 2	24 5	24 9	24 6	25 0		
43.9%	pH (SU)	7.80	7.74	7 80	7 90	7 81	8 02	7 90	8 05	7 83	7 91	7 82	8 15		
	DO (mg/L)	7 9	8 0	8.2	8.4	8.3	8 2	8.1	8.3	8 0	7.9	7.9	8 3		
	Conductivity (µmhos/cm)	248		247		261		259		254		256			
	Temperature (°C)	24.7	24.9	24 6	25 3	24.7	25 0	24 7	25.2	24 5	24.9	24.6	25 0		
72%	pH (SU)	7 62	7 71	7.76	7 91	7.76	8 00	7 85	8 05	7.78	7.94	7.77	8 13		
	DO (mg/L)	7.9	8 0	8 2	8 4	8 3	8 2	8 1	8 4	8 0	7.9	7.9	8.4		
	Conductivity (µmhos/cm)	214		215		224		222		220		222			
	Temperature (°C)	24.9	24.9	24.7	25 3	24 8	25 0	24 7	25 2	24.6	24.9	24.7	25 0		
100%	pH (SU)	7.70	7 76	7.74	7 87	7 72	7 97	7.90	8 03	7 68	7 89	7 66	8.10		
	DO (mg/L)	8 0	8.0	8 2	8 5	8 3	8 2	8 1	8 4	8 1	8.1	7.9	8.4		
	Conductivity (µmhos/cm)	182		183		192		191		187		188			
	Alkalinity (mg/L $CaCO_3$)	61				63				62					
	Hardness (mg/L $CaCO_3$)	72				74				100					
	Total Residual Chlorine (mg/L)	<0 10				<0 10				<0.10					
	Temperature (°C)	25.3	24.9	24 9	25 3	24 8	25 0	24 7	25 2	24 6	24 9	24.7	25 0		
100% Intake	pH (SU)	7.74	7.75	7.73	7 86	7 42	7.91	7 84	7.96	7.60	7 87	7.65	8 07		
	DO (mg/L)	8.2	8.3	8.3	8 4	8 4	8.1	8 0	8.0	8.1	8.0	8.0	8.1		
	Conductivity (µmhos/cm)	181		181		195		190		183		185			
	Alkalinity (mg/L $CaCO_3$)	62				62				57					
	Hardness (mg/L $CaCO_3$)	86				80				82					
	Total Residual Chlorine (mg/L)	<0 10				<0.10				<0.10					
	Temperature (°C)	25.2	24.9	24.8	25 3	24.7	25 0	24 7	25 2	24 6	24 9	24.7	25 0		

Species: *Pimephales promelas*

Client: TVA- Sequoyah NONTREATED

Date: 10.08.02

Full-strength Chemistry: Outfall 101

Parameter	Sample Number:			Control Batch:		
	1	2	3	10.07.02	10-09-02	10-11-02
pH (S.U.)	7.70	7.72	7.68	7.82	7.87	7.96
DO (mg/L)	8.0	8.3	8.1	7.8	7.8	7.9
Conductivity (µmhos/cm)	182	192	187	294	301	314
Alkalinity (mg $CaCO_3$/L)	61	63	62	61	62	60
Hardness (mg $CaCO_3$/L)	72	74	100	82	86	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	10.06.02	10-08-02	10-10-02			
Collection end time	0641	0949	1230			
Grab or Composite (duration)	24.8 23-hour comp	24 ~~23~~ HOUR COMPOSITE	24 ~~23~~ HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.8°C	2.4°C			
Physical characteristics	pale tan. Clear	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	10.08.02 10.09.02	10.10.02 10.11.02	10.12.02 10.13.02 10.14.02			
ETS Project and Sample numbers	483 021008.04	021010.03	07 021012.~~08~~			

Species: *Pimephales promelas*

Client: TVA- Sequoyah NONTREATED **Date:** 10.08.02

Full-strength Chemistry: Intake

Parameter	Sample Number:			Control Batch:		
	1	2	3	10.07.02	10.09.02	10.11.02
pH (S.U.)	7.74	7.42	7.60	7.82	7.87	7.96
DO (mg/L)	8.2	8.4	8.1	7.8	7.8	7.9
Conductivity (µmhos/cm)	181	195	183	294	301	314
Alkalinity (mg $CaCO_3$/L)	62	62	57	61	62	60
Hardness (mg $CaCO_3$/L)	86	80	82	82	86	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	10.06.02	10-08-02	10-10-02			
Collection end time	0656	1009	1242			
Grab or Composite (duration)	~~23~~ 24 hour Comp	~~23~~ 24 HOUR COMPOSITE	~~23~~ 24 HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.8°C	2.4°C			
Physical characteristics	Pale tan, Clear	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	10.08.02 10.09.02	10-10.02 10.11.02	10.12.02 10.13.02 10.14.02			
ETS Project and Sample numbers	483 021008.05	021010.03	021012.08			

Species: *Pimephales promelas*

Client: TVA-Sequoyah NONTREATED

Date: 10-08-02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	7.82	7.32	7.71	7.25	7.92	7.58
	DO (mg/L)	7.8	7.1	8.1	6.9	8.4	7.2
	Conductivity (µmhos/cm)	294		302		314	
	Temperature (°C)	24.4	24.8	24.2	25.0	24.6	24.9
10.98%	pH (S.U.)	7.84	7.31	7.83	7.20	7.86	7.41
	DO (mg/L)	7.8	7.1	8.2	6.9	8.2	7.2
	Conductivity (µmhos/cm)	283		288		301	
	Temperature (°C)	24.4	24.8	24.5	25.0	24.5	24.9
22%	pH (S.U.)	7.83	7.33	7.82	7.24	7.84	7.40
	DO (mg/L)	7.8	7.0	8.2	6.8	8.2	6.7
	Conductivity (µmhos/cm)	270		271		286	
	Temperature (°C)	24.6	24.8	24.5	25.0	24.5	24.9
43.9%	pH (S.U.)	7.80	7.33	7.80	7.17	7.81	7.36
	DO (mg/L)	7.9	7.0	8.2	6.8	8.3	6.5
	Conductivity (µmhos/cm)	248		247		261	
	Temperature (°C)	24.6	24.8	24.7	25.0	24.7	24.9
72%	pH (S.U.)	7.62	7.32	7.76	7.21	7.76	7.38
	DO (mg/L)	7.9	7.1	8.2	6.8	8.3	6.5
	Conductivity (µmhos/cm)	214		215		224	
	Temperature (°C)	24.7	24.8	24.9	25.0	24.7	24.9
100%	pH (S.U.)	7.70	7.28	7.74	7.19	7.72	7.34
	DO (mg/L)	8.0	7.2	8.2	6.9	8.3	6.4
	Conductivity (µmhos/cm)	182		183		192	
	Temperature (°C)	25.0	24.8	25.0	25.0	24.7	24.9
Intake 100%	pH (S.U.)	7.74	7.37	7.73	7.21	7.42	7.38
	DO (mg/L)	8.2	7.2	8.3	6.7	8.4	7.2
	Conductivity (µmhos/cm)	181		181		195	
	Temperature (°C)	25.2	24.8	24.9	25.0	24.6	24.9
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Client: TVA - Sequoyah NONTREATED

Date: 10-08-02

Concentration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
CONTROL	pH (S.U.)	7.97	7.42	7.87	~~7.41~~*	7.84	7.79	7.96	7.74
	DO (mg/L)	8.1	6.9	7.8	7.50 6.9	7.8	7.6	7.9	7.7
	Conductivity (µmhos/cm)	312		301		304		314	
	Temperature (°C)	24.6	25.3	24.3	25.0	24.7	24.8	24.6	25.3
10.98%	pH (S.U.)	7.94	7.36	7.90	~~7.82~~	7.89	7.78	7.82	7.70
	DO (mg/L)	8.0	6.9	8.0	7.40 6.9	7.8	7.7	8.0	7.7
	Conductivity (µmhos/cm)	294		290		293		302	
	Temperature (°C)	24.7	25.3	24.4	25.0	24.7	24.8	24.7	25.3
22%	pH (S.U.)	7.93	7.33	7.87	7.43	7.87	7.74	7.83	7.69
	DO (mg/L)	8.1	6.8	8.0	6.6	7.9	7.7	8.0	7.7
	Conductivity (µmhos/cm)	284		277		284		288	
	Temperature (°C)	24.7	25.3	24.4	25.0	24.7	24.8	24.8	25.3
43.9%	pH (S.U.)	7.90	7.32	7.83	7.40	7.82	7.76	7.83	7.72
	DO (mg/L)	8.1	6.9	8.0	6.5	7.9	7.7	8.0	7.7
	Conductivity (µmhos/cm)	259		254		256		263	
	Temperature (°C)	24.7	25.3	24.5	25.0	24.7	24.8	24.8	25.3
72%	pH (S.U.)	7.85	7.30	7.78	7.35	7.77	7.73	7.80	7.70
	DO (mg/L)	8.1	6.7	8.0	6.5	7.9	7.6	8.1	7.7
	Conductivity (µmhos/cm)	222		220		222		226	
	Temperature (°C)	24.7	25.3	24.5	25.0	24.7	24.8	24.8	25.3
100%	pH (S.U.)	7.90	7.30	7.68	7.36	7.66	7.74	7.78	7.71
	DO (mg/L)	8.1	6.9	8.1	6.4	7.9	7.6	8.1	7.8
	Conductivity (µmhos/cm)	191		187		188		191	
	Temperature (°C)	24.7	25.3	24.5	25.0	24.8	24.8	24.8	25.3
Intake 100%	pH (S.U.)	7.84	7.34	7.100	7.36	7.65	7.39	7.72	7.81
	DO (mg/L)	8.0	6.9	8.1	6.4	8.0	8.0	8.1	8.0
	Conductivity (µmhos/cm)	190		183		186		188	
	Temperature (°C)	24.7	25.3	24.4	25.0	24.7	24.8	24.6	25.3

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)
Species: *Pimephales promelas*

Daily Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated
Test dates: October 08-15, 2002
Project number: 483

Reviewed by: Cu

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)	7.85	7 44	7 83	7.26	7 84	7 53	7 89	7 41	7 89	7 30	7.77	7.31	7.92	7 66
	DO (mg/L)	8 0	7 3	8 0	7 0	8 5	7.1	8.1	7.1	7.7	6 4	7.7	7.2	8 0	7 8
	Conductivity (µmhos/cm)	291		291		302		302		296		301		313	
	Alkalinity (mg/L $CaCO_3$)	61								62				60	
	Hardness (mg/L $CaCO_3$)	82								86				82	
	Temperature (°C)	24 5	25.1	24 6	25.1	24 4	24.7	24 4	25 2	24 4	24 9	24.7	24.7	24 6	25.2
10.98%	pH (SU)	7 85	7.40	7 80	7 22	7 82	7 57	7 89	7 42	7.88	7.34	7.73	7.29	7 90	7 68
	DO (mg/L)	8 0	7.3	8.1	7.0	8 5	7.1	8 2	7 0	7.7	6 4	7.7	7.1	7 8	7 8
	Conductivity (µmhos/cm)	284		285		297		295		290		295		306	
	Temperature (°C)	24 6	25.1	24 7	25.1	24 5	24.7	24 5	25 2	24.5	24 9	24 8	24.7	24 9	25.2
22%	pH (SU)	7 84	7 42	7.76	7 22	7 83	7 52	7 89	7.38	7 86	7 34	7.72	7.28	7 83	7 65
	DO (mg/L)	8 0	7 4	8.1	6 9	8.5	7.1	8 2	6 8	7.7	6 6	7 8	6 9	7.8	7.9
	Conductivity (µmhos/cm)	270		270		284		281		275		282		297	
	Temperature (°C)	24 6	25 1	24.8	25 1	24.5	24 7	24 5	25.2	24 5	24.9	24 8	24.7	24 9	25 2
43.9%	pH (SU)	7 82	7.37	7.79	7 23	7.81	7 52	7 88	7.36	7 84	7 24	7 67	7.28	7.87	7 63
	DO (mg/L)	8 0	7.3	8 2	6 8	8.5	7 0	8 2	6.8	7.7	6 6	7 7	6.9	7 8	7 8
	Conductivity (µmhos/cm)	248		246		260		256		252		257		277	
	Temperature (°C)	24 7	25.1	24 8	25.1	24 6	24.7	24.5	25 2	24 5	24.9	24.7	24 7	24 8	25 2
72%	pH (SU)	7 80	7 36	7.76	7.29	7.79	7.51	7.86	7.35	7 81	7.24	7.65	7 26	7 84	7 62
	DO (mg/L)	8 0	7 2	8.2	6 9	8.5	7 0	8.1	6 9	7 6	6 6	7.7	6.7	7.9	7.7
	Conductivity (µmhos/cm)	214		215		223		219		220		224		237	
	Temperature (°C)	24.7	25 1	24 9	25.1	24 6	24.7	24.8	25 2	24.5	24.9	24.7	24.7	24 8	25.2
100%	pH (SU)	7.59	7 34	7.72	7.26	7.73	7.47	7.82	7 37	7.77	7.20	7.59	7.25	7.79	7 63
	DO (mg/L)	8 0	7 4	8 2	6 8	8 4	7 0	8 0	6 6	7 6	6.5	7.7	6 8	8 0	7.7
	Conductivity (µmhos/cm)	180		182		192		190		187		190		200	
	Alkalinity (mg/L $CaCO_3$)	61				63				62					
	Hardness (mg/L $CaCO_3$)	72				74				100					
	Total Residual Chlorine (mg/L)	<0 10				<0 10				<0 10					
	Temperature (°C)	24 9	25.1	25 1	25.1	24 6	24.7	24 8	25 2	24.5	24 9	24 8	24 7	24 9	25.2
100% Intake	pH (SU)	7 71	7.41	7.72	7.20	7.72	7.53	7.78	7 35	7.74	7.24	7.55	7.33	7.66	7.64
	DO (mg/L)	8.1	7.3	8.1	7.0	8.4	7.0	7 9	6 7	7.8	6 6	7.7	6 6	8 0	7.9
	Conductivity (µmhos/cm)	180		180		191		186		183		187		186	
	Alkalinity (mg/L $CaCO_3$)	62				62				57					
	Hardness (mg/L $CaCO_3$)	86				80				82					
	Total Residual Chlorine (mg/L)	<0 10				<0 10				<0.10					
	Temperature (°C)	25 4	25 1	25 2	25 1	24 6	24 7	24 6	25 2	24 5	24 9	24.8	24.7	24 8	25 2

Species: *Pimephales promelas*

Client: TVA Sequoyah UV Treated **Date:** 10-08-02

Full-strength Chemistry: Outfall 101

Parameter	Sample Number:			Control Batch:		
	1	2	3	10.07.02	10.09.02	10-11-02
pH (S.U.)	7.59	7.73	7.77	7.85	7.89 ~~7.84~~	7.92
DO (mg/L)	8.0	8.4	7.6	8.0	7.7 ~~8.5~~	8.0
Conductivity (µmhos/cm)	180	192	187	291	290 ~~302~~	313
Alkalinity (mg $CaCO_3$/L)	61	63	62	61	62	60
Hardness (mg $CaCO_3$/L)	72	74	100	82	86	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	10.06.02	10-08-02	10-10-02			
Collection end time	0641	0949	1230			
Grab or Composite (duration)	~~23~~ 24-hour Comp	~~23~~ 24-HOUR COMPOSITE	~~23~~ 24 HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.8°C	2.4°C			
Physical characteristics	pale tan, Clear	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	10.08.02 10.09.02	10.10.02 10.11.02	10.12.02 10.13.02 10.14.02			
ETS Project and Sample numbers	483 021008.04	021010.03	021012.07			

Species: *Pimephales promelas*

Client: TVA - Sequoyah UV-Treated

Date: 10.08.02

Full-strength Chemistry: Intake

Parameter	Sample Number:			Control Batch:		
	1	2	3	10-07-02	10.09.02	10-11-02
pH (S.U.)	7.71	7.72	7.74	7.85	7.89 ~~7.84~~	7.92
DO (mg/L)	8.1	8.4	7.8	8.0	7.7 ~~8.5~~	8.0
Conductivity (µmhos/cm)	180	191	183	291	296 ~~302~~	313
Alkalinity (mg $CaCO_3$/L)	62	62	57	61	62	60
Hardness (mg $CaCO_3$/L)	86	80	82	82	86	82
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	10.06.02	10-08-02	10-10-02			
Collection end time	0656	1009	1242			
Grab or Composite (duration)	23-hour comp	23 HOUR COMPOSITE	23 HOUR COMPOSITE			
Temperature (°C) upon receipt	0.3°C	0.8°C	2.4°C			
Physical characteristics	pale tan, clear	PALE TAN CLEAR	PALE TAN CLEAR			
Dates sample used	10.08.02 10.09.02	10.10.02 10.11.02	10.12.02 10.13.02 10.14.02			
ETS Project and Sample numbers	483 021008.05	021010.03	021012.08			

Species: *Pimephales promelas*

Client: TVA - Sequoyah UV-Treated

Date: 10.08.02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	7.85	7.44	7.83	7.26	7.84	7.53
	DO (mg/L)	8.0	7.3	8.0	7.0	8.5	7.1
	Conductivity (µmhos/cm)	291		291		302	
	Temperature (°C)	24.5	25.1	24.6	25.1	24.4	24.7
10.98%	pH (S.U.)	7.85	7.40	7.80	7.22	7.82	7.57
	DO (mg/L)	8.0	7.3	8.1	7.0	8.5	7.1
	Conductivity (µmhos/cm)	284		285		297	
	Temperature (°C)	24.6	25.1	24.7	25.1	24.5	24.7
22%	pH (S.U.)	7.84	7.42	7.76	7.22	7.83	7.52
	DO (mg/L)	8.0	7.4	8.1	6.9	8.5	7.1
	Conductivity (µmhos/cm)	270		270		284	
	Temperature (°C)	24.6	25.1	24.8	25.1	24.5	24.7
43.9%	pH (S.U.)	7.82	7.37	7.79	7.23	7.81	7.52
	DO (mg/L)	8.0	7.3	8.2	6.8	8.5	7.0
	Conductivity (µmhos/cm)	248		246		260	
	Temperature (°C)	24.7	25.1	24.8	25.1	24.6	24.7
72%	pH (S.U.)	7.80	7.36	7.76	7.29	7.79	7.51
	DO (mg/L)	8.0	7.2	8.2	6.9	8.5	7.0
	Conductivity (µmhos/cm)	214		215		223	
	Temperature (°C)	24.7	25.1	24.9	25.1	24.6	24.7
100%	pH (S.U.)	7.59	7.34	7.72	7.26	~~7.33~~	7.47
	DO (mg/L)	8.0	7.4	8.2	6.8	~~7.8~~ 8.4	7.0
	Conductivity (µmhos/cm)	180		182		192	
	Temperature (°C)	24.9	25.1	25.1	25.1	24.6	24.7
Intake 100%	pH (S.U.)	7.71	7.41	7.72	7.20	7.72	7.53
	DO (mg/L)	8.1	~~8.1~~ 7.3	8.1	7.0	8.4	7.0
	Conductivity (µmhos/cm)	180		180		191	
	Temperature (°C)	25.4	25.1	25.2	25.1	24.6	24.7
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas*

Client: TVA Sequoyah UV-Treated

Date: 10-08-02

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	7.89	7.41	7.89	7.30	7.77	7.92	7.31	7.66
	DO (mg/L)	8.1	7.1	7.7	6.4	7.7	7.2	8.0	7.8
	Conductivity (µmhos/cm)	302		296		301		313	
	Temperature (°C)	24.4	25.2	24.4	24.9	24.7	24.7	24.6	25.2
10.98%	pH (S.U.)	7.89	7.42	7.80	7.34	7.73	7.90	7.29	7.68
	DO (mg/L)	8.2	7.0	7.7	6.4	7.7	7.1	7.8	7.8
	Conductivity (µmhos/cm)	295		290		295		306	
	Temperature (°C)	24.5	25.2	24.5	24.9	24.8	24.7	24.9	25.2
22%	pH (S.U.)	7.89	7.38	7.86	7.34	7.72	7.83	7.28	7.65
	DO (mg/L)	8.2	6.8	7.7	6.6	7.8	6.9	7.8	7.9
	Conductivity (µmhos/cm)	281		275		282		297	
	Temperature (°C)	24.5	25.2	24.5	24.9	24.8	24.7	24.9	25.2
43.9%	pH (S.U.)	7.88	7.36	7.84	7.24	7.67	7.87	7.28	7.63
	DO (mg/L)	8.2	6.8	7.7	6.6	7.7	6.9	7.8	7.8
	Conductivity (µmhos/cm)	256		252		257		277	
	Temperature (°C)	24.5	25.2	24.5	24.9	24.7	24.7	24.8	25.2
72%	pH (S.U.)	7.86	7.35	7.81	7.24	7.65	7.84	7.26	7.62
	DO (mg/L)	8.1	6.9	7.6	6.6	7.7	6.7	7.9	7.7
	Conductivity (µmhos/cm)	219		220		224		237	
	Temperature (°C)	24.8	25.2	24.5	24.9	24.7	24.7	24.8	25.2
100%	pH (S.U.)	7.82	7.37	7.77	7.20	7.59	7.79	7.25	7.63
	DO (mg/L)	8.0	6.6	7.6	6.5	7.7	6.8	8.0	7.7
	Conductivity (µmhos/cm)	190		187		190		200	
	Temperature (°C)	24.8	25.2	24.5	24.9	24.8	24.7	24.9	25.2
Intake 100%	pH (S.U.)	7.78	7.35	7.74	7.24	7.55	7.33	7.60	7.64
	DO (mg/L)	7.9	6.7	7.8	6.6	7.7	6.6	8.0	7.9
	Conductivity (µmhos/cm)	186		183		187		186	
	Temperature (°C)	24.6	25.2	24.5	24.9	24.8	24.7	24.8	25.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Alkalinity
(EPA Method 310.1)

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

Analyst	KM
Date analyzed	10-15-02

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
7.5	IN R088	IN SS110	0.3	12.9	12.6	0.0198	9.9

BlkCorr 0.0 - 0.3 = 0.3 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%)
IN R065	100	100	~~12.6~~ 12.9	22.9	10	9.9	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%)
10.07.02	MHS	100	22.9	29.2	6.3	9.9	S 62	
10.07.02	Duplicate	100	29.2	35.4	6.2	1	D 61	1.67%

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 R065	50	100	29.2	40.5	11.3	9.9	120

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
61	59	118%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
10.01.02	MHS	100	40.5	46.8	6.3	9.9	62
10.05.02			1.0	7.2	6.2		61
10.07.02A			7.2	13.4	6.2		61
↓ B			13.4	19.5	6.1		60
10.09.02			19.5	25.8	6.3		62
10.11.02			26.0	32.1	6.1		60
10.13.02	↓		32.1	38.4	6.3		62
10.05.02	SSW H_2O		38.4	41.9	3.5		35
10.01.02	SALT SW 34	↓	0.0	20.3	20.3	↓	200

Reviewed by: [signature] Date reviewed: 10-28-02

Alkalinity
(EPA Method 310.1)

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

Analyst	KK
Date analyzed	10.15.02

Titrate samples to pH = 4.50 S.U.

~~Titrant normality and multiplier determination:~~

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	~~Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)~~	~~pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500~~

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INR065	100	100	19.1	29.0	9.9	9.9	98	98%

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%)
021010.03	SQN 101 2	100	29.3	35.7	6.4	9.9	S 63	
↓	Duplicate	↓	35.7	42.2	6.5	↓	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)
INR065	50	100	35.7	47.2	11.5	9.9	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%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
021008.04	SQN 101 1	100	1.1	7.3	6.2	9.9	61
021012.07	↓ 3	↓	7.3	13.6	6.3	↓	62
021008.05	SQN INT 1	↓	13.6	19.9	6.3	↓	62
021010.03	↓ 2	↓	20.0	26.3	6.3	↓	62
021012.08	↓ 3	↓	26.4	32.2	5.8	↓	57
	PPAC 6.25	↓	32.5	38.7	6.2	↓	61
	CdAC 6.25	↓	38.7	44.9	6.2	↓	61
	MYAC ↓	25	0.0	4.8	4.8	(4) ↓	190
	MBAC ↓	↓	5.0	9.8	4.8	↓	190

Reviewed by: [illegible]

Date reviewed: 10-28-02

Total Hardness
(EPA Method 130.2)

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

Analyst	KEL
Date analyzed	10.14.02

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
INR050	INSS092	0.0	10.0	10.0	0.020	20

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%)
INSS101	40	50	10.0	12.1	2.1	20	42	105

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
10.01-02	MHS H2O	50	12.1	17.0	4.9	20	S 98	
10.01-02	Duplicate	↓	17.0	21.5	4.5	↓	D 90	8.5%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS101	40	50	17.0	23.5	6.5	20	130

Sample hardness (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
90	40	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV=ND	Blank (should be = 0 mg $CaCO_3$/L)	50	0.0	0.0	0.0	20	ND
10.02.02	MHS		23.5	27.8	4.3		86
10.05-02			27.8	32.0	4.2		84
10.07-02 A			32.0	36.1	4.1		82
↓ B			36.1	40.2	4.1		82
10.09.02			40.2	44.5	4.3		86
10.11.02			44.5	48.6	4.1		82
10.13.02	↓		0.0	4.0	4.0		80
10.05-02	SSW H2O		4.0	6.2	2.2		44
021008.01	S. Island	↓	6.3	8.8	2.5	↓	50

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [signature] Date reviewed 10-28-02

Total Hardness
(EPA Method 130.2)

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

Analyst	KB
Date analyzed	10-14-02

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

Laboratory control standard:

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%)
INSS101	40	50	0.1	2.1	2.0	20	40	100

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
021008.04	SQN 101 1	50	2.1	5.7	3.6	20	S 72	
↓	Duplicate	50	5.7	9.5	3.8	20	D 76	5.4%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS101	40	50	5.7	11.5	5.8	20	116 = 120

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%)
76	40	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)						
021010.03	SQN 101 2	50	11.5	15.2	3.7	20	74
021012.07	↓ 3	↓	15.2	20.2	5.0	↓	100
021008.05	SQN INT 1		20.2	24.5	4.3		86
021010.03	↓ 2		24.5	28.5	4.0		80
021012.08	↓ 3		28.5	32.6	4.1		82
	CdAC 6.25		32.6	37.2	4.6		92
021010.04	NA CEP PS pH 7.5	10	0.4	8.45	4.1	(5)	410
↓	↓ pH 8.0	↓	4.5	8.2	3.7	↓	370
	↓ pH 8.5		8.2	11.7	3.5		350

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [signature] Date reviewed 10-28-02

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L
Meter: Accumet Model 25 pH/Ion Meter

Analyst	MHL
Date analyzed	10.08.02

Iodide reagent:	INR051
Acid reagent:	INR059
Slope:	27.4

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5091	INS5091

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%)
INS5091	0.50	0.540	108 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
021008.01	S.Island	no color clear	S <0.00091	
	Duplicate		D <0.00054	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00840
0261008.03	Roxboro WWTP	tan, clear	0.0524
021008.02	Anderson Co. SA	pale green. Clear	<0.00817
021008.04	TVA - SQN 101	pale tan, Clear	<0.0044
021008.05	TVA. SQN INT	pale tan Clear	<0.00473

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%)
INS5091	0.50	0.545	109%

Reviewed by	JI
Date reviewed	10-28-02

Environmental Testing Solutions, LLC

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L
Meter: Accumet Model 25 pH/Ion Meter

Analyst	KW
Date analyzed	10.10.02

Iodide reagent:	INR054
Acid reagent:	INR059
Slope:	27.8

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS091	INSS091

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%)
INSS091	0.50	0.503	100.6%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
021010.05	Anderson CO	pale green, clear	S <0.00694	
↓	Duplicate		D <0.00562	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00913
021010.01	Roxboro WWTP	tan, clear	0.0479
021010.02	TVA-SQN-101	pale tan, clear	<0.00862
021010.03	TVA-SQN-INT	pale tan, clear	<0.00722

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

021010.04 TVA-Pond 5100'. green, cloudy <0.00329

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%)
INSS091	0.50	0.490	98.0%

Reviewed by	
Date reviewed	10.28.02

Total Residual Chlorine
(EPA Method 330.5)

Matrix: Water, MDL = 0.10 mg/L
Meter: Accumet Model 25 pH/Ion Meter

Analyst	KEL
Date analyzed	10-12-02

Iodide reagent:	INR054
Acid reagent:	INR059
Slope:	27.7

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INS5091	INS6091

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%)
INS5091	0.50	0.474	94.8%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
021012.01	Anderson.Co	pale yellow, clear	S <0.00746	
↓	Duplicate		D <0.00602	–

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0 10 mg/L)		<0.00692
021012.03	Roxboro WWTP	pale tan, slightly cloudy	0.0291
021012.07	TVA-SQN-101	pale tan, clear	<0.00662
021012.08	TVA-SQN-Int	pale tan, clear	<0.00483

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%)
INS6091	0.50	0.463	92.6%

Reviewed by	[illegible]
Date reviewed	10-28-02

Sequoyah Nuclear Plant Biomonitoring
October 08-15, 2002

Appendix D

Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, LLC

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

Test number	Test date	7-day IC_{25} (g KCl/L)	CT (g/L KCl)	S	Control Limits CT - 2S	Control Limits CT + 2S	$S_{A.10}$	Warning Limits $CT - S_{A.10}$	Warning Limits $CT + S_{A.10}$	$S_{A.25}$	Control Limits $CT - S_{A.25}$	Control Limits $CT + S_{A.25}$	CV
1	12-12-01	0 57											
2	01-04-02	0 63	0 60	0 04	0 52	0 69	0.07	0 48	0 72	0.13	0.39	0 81	0 07
3	02-05-02	0 49	0 56	0 07	0 42	0.71	0 07	0 44	0 68	0.12	0.35	0.77	0.13
4	02-13-02	0 61	0 58	0 06	0 45	0.70	0 07	0 46	0.70	0.12	0.37	0.79	0.11
5	02-26-02	0 65	0 59	0 06	0 46	0.72	0 07	0 47	0 71	0.12	0.38	0 80	0.11
6	03-28-02	0 56	0.59	0.06	0.47	0.70	0 07	0 47	0.71	0.12	0.38	0.80	0.10
7	04-23-02	0.70	0 60	0 07	0 46	0.74	0 07	0 48	0.72	0.13	0.39	0.81	0.12
8	05-07-02	0 61	0 60	0 06	0 47	0.73	0 07	0.48	0.72	0.13	0.39	0 81	0.11
9	05-23-02	0.76	0 62	0 08	0 46	0.78	0 07	0 50	0.74	0.13	0.41	0.83	0.13
10	05-24-02	0 66	0 63	0 08	0 47	0.78	0.08	0 51	0.75	0.13	0.42	0.84	0.12
11	06-04-02	0.67	0.63	0 07	0.48	0.78	0 08	0.51	0.75	0.13	0.42	0 84	0.12
12	06-11-02	0.70	0 64	0 07	0 49	0.78	0 08	0 52	0.76	0.13	0.43	0.85	0.12
13	08-06-02	0 55	0 63	0.07	0 48	0 78	0 08	0 51	0.75	0.13	0.42	0.84	0.12
14	08-13-02	0.58	0 63	0 07	0.48	0.77	0 08	0 51	0.75	0.13	0.42	0.84	0.12
15	08-20-02	0 63	0 63	0 07	0 49	0.76	0 08	0.51	0.75	0.13	0.42	0.84	0.11
16	09-10-02	0 61	0 62	0 07	0 49	0.76	0 07	0.50	0.74	0.13	0.41	0.83	0.11
17	09-17-02	0 64	0 63	0 07	0.50	0.76	0 08	0.51	0.75	0.13	0.42	0.84	0.10
18	10-01-02	0 60	0 62	0.06	0 50	0.75	0 07	0.50	0.74	0.13	0.41	0.83	0.10
19	10-01-02	0.47	0 62	0 07	0 47	0.76	0.07	0 50	0.74	0.13	0.41	0.83	0.12
20	10-08-02	0 53	0 61	0 07	0 47	0.76	0 07	0.49	0.73	0.13	0.40	0.82	0.12

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.

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. $S_{A.10} = 0.12$, as determined by USEPA for the method and endpoint.

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV. $S_{A.25} = 0\ 21$, as determined by the USEPA for the method and endpoint.

CV = Coefficient of variation of the IC25 values.

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.

USEPA Recommended Control and Warning Limits.

Warning Limit = Standard deviation corresponding to the 75th percentile CV $S_{A\ 75} = 0\ 38$

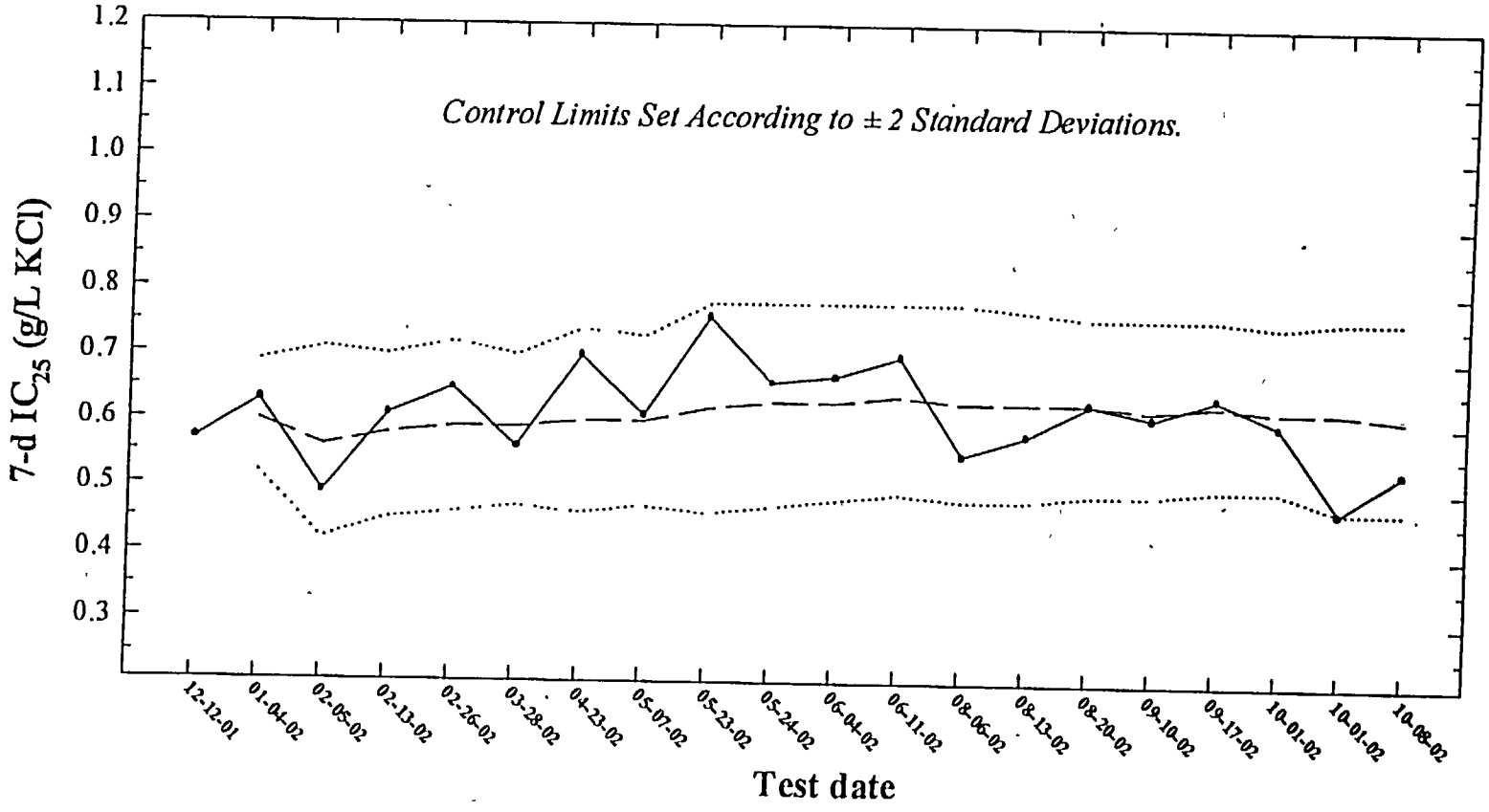
Control Limit = Standard deviation corresponding to the 90th percentile CV. $S_{A\ 90} = 0\ 45$

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

Organisms obtained from Aquatic BioSystems, Inc

Environmental Testing Solutions, LLC

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



—•— 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

— – Central Tendency (mean IC_{25})

· ·· ·· Control Limits (mean IC_{25} ± 2 Standard Deviations)

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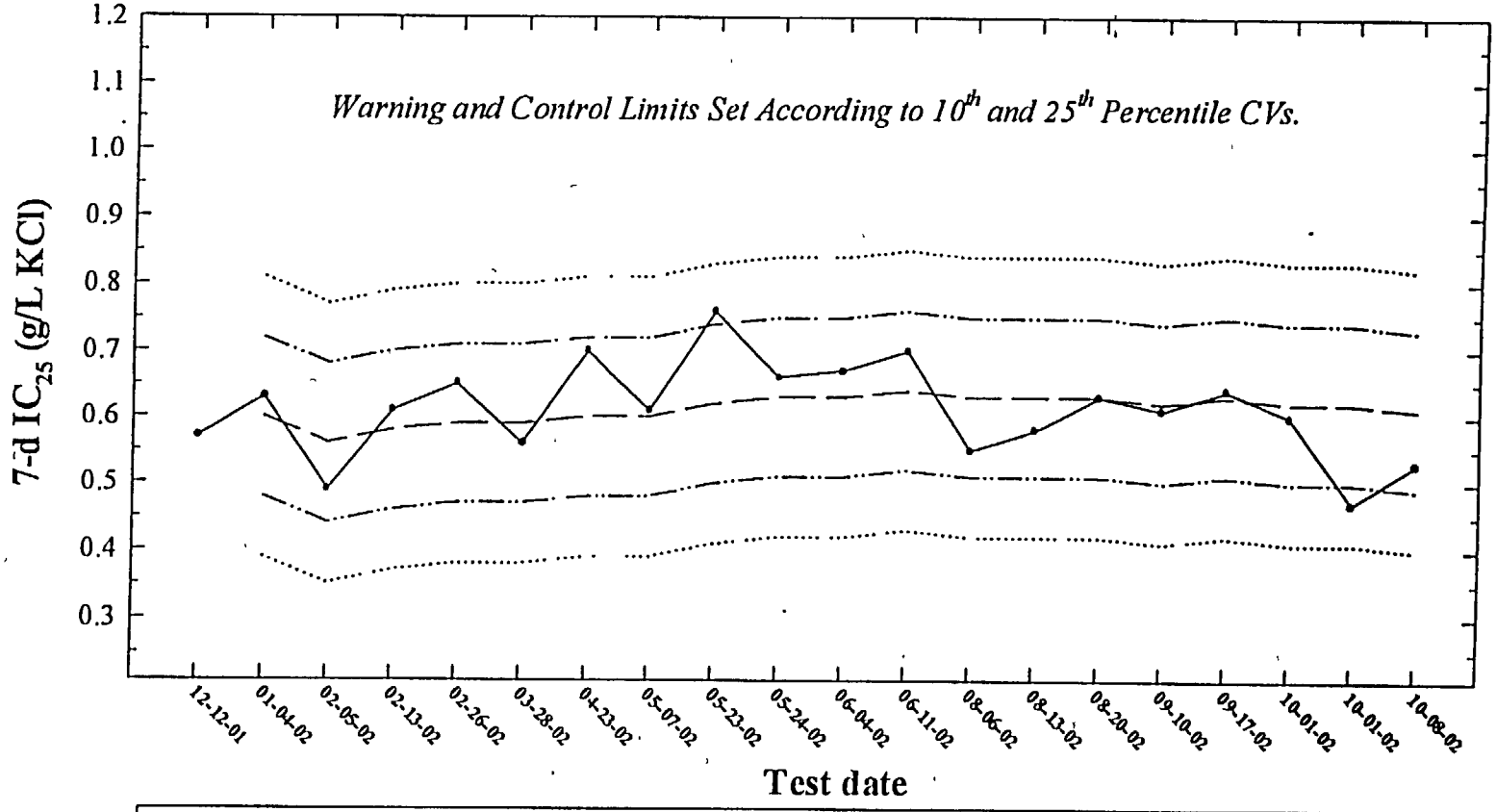

—•— 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of potassium chloride that would cause a 25% reduction in *Pimephales* growth for the test population.

— – Central Tendency (mean IC_{25})

—·— Warning Limits (mean $IC_{25} \pm S_{A.10}$, $S_{A.10} = 0.12$, as determined by USEPA for the method and endpoint)

····· Control Limits (mean $IC_{25} \pm S_{A\ 25}$, $S_{A\ 25} = 0.21$, as determined by USEPA for the method and endpoint)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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

Test number	Test date	Control Survival (%)	Control Mean Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	12-12-01	95	0.824	16.6		0.19	23.5	
2	01-04-02	95	0.799	10.1	13.3	0.18	22.0	22.8
3	02-05-02	97.5	0.948	6.9	11.2	0.21	22.2	22.6
4	02-13-02	100	0.648	8.0	10.4	0.10	15.5	20.8
5	02-26-02	100	0.642	3.3	9.0	0.11	16.5	20.0
6	03-28-02	100	0.629	11.2	9.3	0.13	21.4	20.2
7	04-23-02	100	0.712	12.8	9.8	0.19	26.2	21.1
8	05-07-02	97.5	0.458	12.3	10.1	0.07	15.4	20.4
9	05-23-02	100	0.378	9.9	10.1	0.09	22.5	20.6
10	05-24-02	97.5	0.444	21.3	11.2	0.11	25.0	21.0
11	06-04-02	100	0.682	14.0	11.5	0.15	22.1	21.1
12	06-11-02	100	0.650	3.7	10.8	0.11	16.6	20.8
13	08-06-02	97.5	0 694	22.2	11.7	0.16	23.5	21.0
14	08-13-02	100	0.659	13.6	11.8	0.12	17.5	20.7
15	08-20-02	100	0.765	8.5	11.6	0.12	16.3	20.4
16	09-10-02	100	0.854	1.2	11.0	0.11	12.5	19.9
17	09-17-02	100	0 824	13.4	11.1	0.12	14.6	19.6
18	10-01-02	97.5	0.750	18.4	11.5	0.19	25.4	19.9
19	10-01-02	100	0.975	12.7	11.6	0.13	12.8	19.6
20	10-08-02	97.5	0.929	8.0	11.4	0.18	19.5	19.6

Note. Average control growth (mg/larvae) = 0.713

CV = Coefficient of variation for control survival.
On average, the CV for control growth is 11.4% in Environmental Testing Solutions, LLC Pimephales chronic toxicity tests
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19.6% from the control
Lower PMSD bound determined by USEPA (10th percentile) = 9 4%
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

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

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

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

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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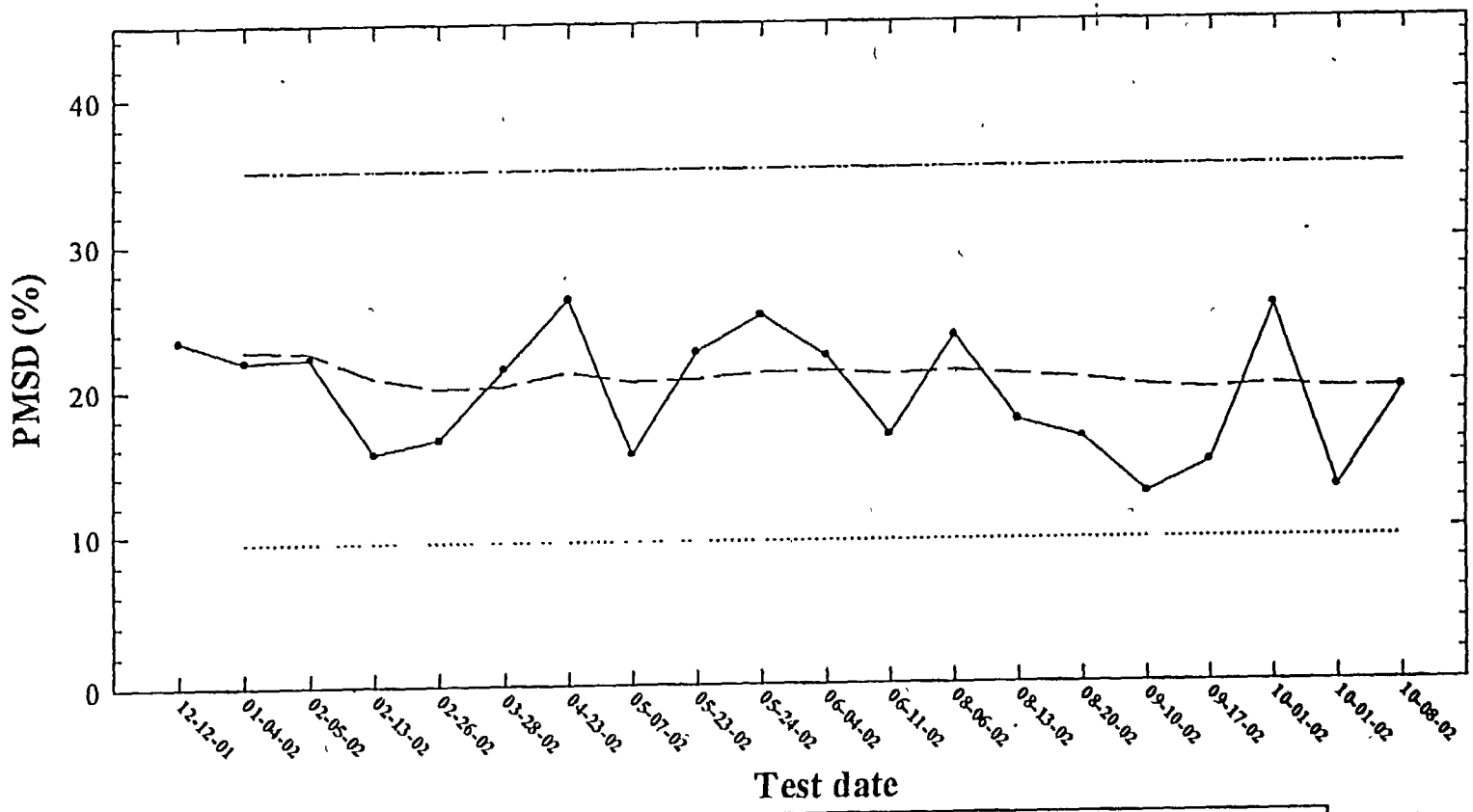

—•— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— - Central Tendency (mean PMSD)

····· Lower and Upper PMSD Bounds

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

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

Potassium Chloride Chronic Reference Toxicant Test
(EPA/600/4-91/002 Method 1000.0)
Species: *Pimephales promelas*

PpKClCR Test Number: 36

Dilution preparation information:						*Comments:*
KCl CHM number:		CHM067				
Stock preparation:		50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water				
Dilution prep (mg/L)	300	450	600	750	900	
Stock volume (mL)	6	9	12	15	18	
Diluent volume (mL)	994	991	988	985	982	

Test organism information: 24.5 to 26.5		*Test information:*	
Organism age:	24 HOURS OLD	Randomizing template:	RED
Date and times organisms were born between:	10-07-02 1030 TO 1330 MDT 1230 to 1530 EDT	Incubator number:	2
Organism source:	ABS BATCH 10-07-02	*Artemia* lot number:	BG 1809 Q
Transfer bowl information:	pH = 7.98 Temperature = 24.1°C	Oven temperature:	102°C
		Drying time:	19-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	10-08-02	—	1640	1500	dl
1	10-09-02	1027	1630	1450	dl
2	10-10-02	0953	1600	1509	KEK
3	10-11-02	1014	1631	1415	dl
4	10-12-02	1100	1700	1420	dl
5	10-13-02	0957	1600	1426	dl
6	10-14-02	1002	1615	1433	dl
7	10-15-02	—	—	1520	KEK

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	2.5%	≤ 20%	7-day LC50	680.8
Average weight per larvae:	0.9288	≥ 0.25 mg/larvae	NOEC	450
			LOEC	600
			ChV	519.6
			IC25	525.7

PpKClCR Test Number: 36

Survival and Growth Data

Day	CONTROL				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	9 1d	10	10	10	10	10	10	10	10	10	10	10
4	9	10	10	10	10	10	10	10	10	10	10	10
5	9	10	10	10	10	10	10	10	10	10	10	9 1d
6	9	10	10	10	10	10	10	10	10	10	10	9
7	9	10	10	10	10	10	10	10	10	10	10	9
A = Pan weight (mg) Red	14.867	15.012	14.944	15.086	14.933	14.984	15.161	15.005	14.807	15.857	14.689	14.777
B = Pan + Larvae weight (mg)	24.23	25.05	23.22	24.58	23.96	23.75	20.43	24.04	23.10	23.17	23.42	22.82
Larvae weight (mg) = A – B	9.363	10.038	8.256	9.494	9.027	8.766	5.269	9.035	8.293	7.913	8.931	8.043

Calculations and data reviewed: JF

Comments:

PpKClCR Test Number: 36

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	9 1d	7 3d	8 2d	9 1d	7 3d	6 4d	7 3d	8 2d	7 3d	6 4d	7 3d	3 7d
2	9	6 1d	7 1d	8 1d	7	4 2d	7	4 4d	3 4d	3 3d	6 1d	0 3d
3	7 2d	6	7	8	5 2d	4	5 2d	2 2d	3	3	1 5d	0
4	7	6	7	8	4 1d	4	4 1d	2	3	2 1d	1	0
5	7	6	7	8	3 1d	4	4	2	3	2	1	0
6	7	6	7	8	2 1d	4	3 1d	2	3	2	1	0
7	7	6	7	8	2	4	3	1 1d	3	2	1	0
A = Pan weight (mg) Rea	14.739	15.131	14.991	14.646	15.039	14.797	15.185	15.149	14.751	15.160	15.054	—
B = Pan + Larvae weight (mg)	20.70	21.30	20.37	20.31	17.07	18.32	17.13	16.36	17.28	16.84	15.38	—
Larvae weight (mg) = A – B	5.961	6.169	5.379	5.664	2.031	3.523	1.945	1.211	2.529	1.680	0.326	—

Calculations and data reviewed: df

Comments:

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1000.0)
Species: *Pimephales promelas*

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

Test number: PpKClCR # 36

Test dates: October 8-15, 2002

Reviewed by: [signature]

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	9	14 867	24 230	9 363	0 9363	97.5	0.9288	8.0	Not applicable
	B	10	10	15 012	25 050	10 038	1 0038				
	C	10	10	14 964	23 220	8 256	0 8256				
	D	10	10	15 086	24 580	9 494	0 9494				
300	E	10	10	14 933	23 960	9 027	0 9027	100 0	0.8024	22.9	13.6
	F	10	10	14 984	23 750	8 766	0 8766				
	G	10	10	15 161	20 430	5 269	0 5269				
	H	10	10	15 005	24 040	9 035	0 9035				
450	I	10	10	14 807	23 100	8 293	0 8293	97.5	0.8295	5.5	10.7
	J	10	10	15 257	23 170	7 913	0 7913				
	K	10	10	14 689	23 620	8 931	0 8931				
	L	10	9	14 777	22 820	8 043	0 8043				
600	M	10	7	14 739	20 700	5 961	0 5961	70 0	0.5793	6.0	37.6
	N	10	6	15 131	21 300	6 169	0 6169				
	O	10	7	14 991	20 370	5 379	0 5379				
	P	10	8	14 646	20,310	5 664	0 5664				
750	Q	10	2	15 039	17 070	2 031	0 2031	25.0	0.2178	44.5	76.6
	R	10	4	14,797	18 320	3,523	0 3523				
	S	10	3	15 185	17,130	1 945	0 1945				
	T	10	1	15 149	16 360	1 211	0 1211				
900	U	10	3	14 751	17 280	2 529	0 2529	15 0	0.1134	104.2	87.8
	V	10	2	15 160	16 840	1 680	0 1680				
	W	10	1	15 054	15,380	0 326	0 0326				
	X	10	0	0 000	0 000	0 000	0 0000				

Dunnett's MSD value: 0 1814

PMSD: 19 5

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19 6% from the control (determined through reference toxicant testing)

Lower PMSD bound determined by USEPA (10th percentile) = 9 4%.

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

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

Organisms obtained from Aquatic BioSystems, Inc

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	10/8/02	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	EPAF 91-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.9363	1.0038	0.8256	0.9494
300	0.9027	0.8766	0.5269	0.9035
450	0.8293	0.7913	0.8931	0.8043
600	0.5961	0.6169	0.5379	0.5664
750	0.2031	0.3523	0.1945	0.1211
900	0.2529	0.1680	0.0326	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	0.9288	1.0000	0.9288	0.8256	1.0038	8.047	4				0.9288	1.0000
300	0.8024	0.8640	0.8024	0.5269	0.9035	22.944	4	1.519	2.180	0.1814	0.8160	0.8785
450	0.8295	0.8931	0.8295	0.7913	0.8931	5.454	4	1.193	2.180	0.1814	0.8160	0.8785
600	0.5793	0.6238	0.5793	0.5379	0.6169	5.960	4				0.5793	0.6238
750	0.2178	0.2344	0.2178	0.1211	0.3523	44.525	4				0.2178	0.2344
900	0.1134	0.1221	0.1134	0.0000	0.2529	104.151	4				0.1134	0.1221

Auxiliary Tests

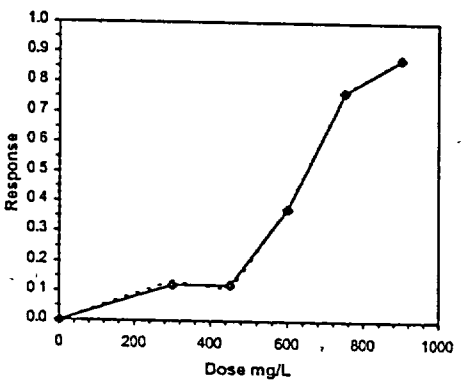
	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.83457917	0.805	-1.715017481	3.537392485
Bartlett's Test indicates equal variances (p = 0.08)	5.026460171	9.21035099		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	450	>450			0.1813629	0.195271083	0.017701936	0.013842479	0.324476004	2, 9

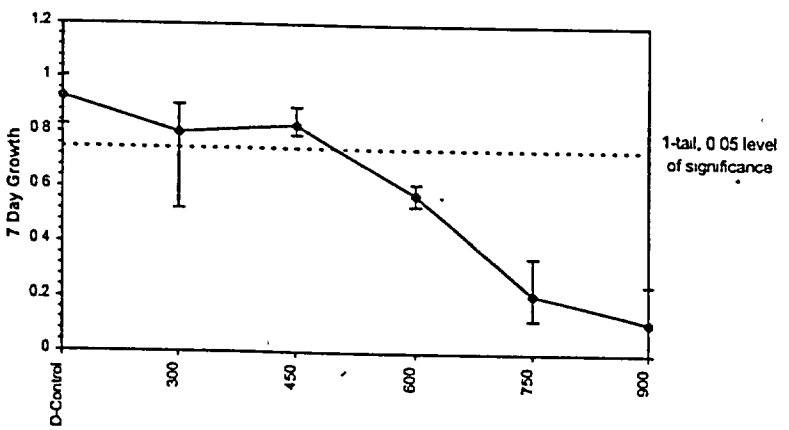
Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	123.49	111.83	33.03	583.98	1.0147
IC10*	246.99	117.52	66.06	601.95	0.1988
IC15	466.80	106.05	41.29	516.10	-1.0955
IC20	496.24	72.43	130.76	544.47	-2.2520
IC25	525.67	40.81	433.31	573.47	-4.1016
IC40	609.15	11.18	568.63	637.24	-0.2280
IC50	647.68	10.33	619.98	689.28	0.6529

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

PpKClCR Test Number: 36

MHS Control Chemistry:

Parameter	Control Batch:		
	10-07-02	10-09-02	10-11-02
pH (S.U.)	7.82	7.87	7.96
DO (mg/L)	7.8	7.8	7.9
Conductivity (µmhos/cm)	294	301	~~313~~ 314
Alkalinity (mg $CaCO_3$/L)	61	62	60
Hardness (mg $CaCO_3$/L)	82	86	82

Acceptance Criteria for Daily Chemistry:

Concentration	Acceptance Criteria (dilutions must be remade if the conductivity falls outside the acceptable range)
CONTROL	280 - 360
300 mg KCl/L	840 - 890
450 mg KCl/L	1100 - 1180
600 mg KCl/L	1390 - 1460
750 mg KCl/L	1660 - 1710
900 mg KCl/L	1890 - 1950
KCl Stock (25 g KCl/L)	67000 - 76000

PpKClCR Test Number: ~~37~~ 36

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	7.82	7.52	7.71	7.62	7.92	7.58
	DO (mg/L)	7.8	7.5	8.1	8.0	8.4	7.6
	Conductivity (µmhos/cm)	294		302		314	
	Temperature (°C)	24.4	25.0	24.3	24.9	24.4	25.1
300 mg KCl/L	pH (S.U.)	8.02	7.72	7.92	7.73	7.96	7.63
	DO (mg/L)	~~8.7~~ 8.4	7.6	8.2	8.0	8.5	7.6
	Conductivity (µmhos/cm)	850		860		853	
	Temperature (°C)	24.4	25.0	24.3	24.9	24.4	25.1
450 mg KCl/L	pH (S.U.)	8.03	7.77	7.96	7.71	7.96	7.61
	DO (mg/L)	8.4	7.6	8.2	8.1	8.5	7.3
	Conductivity (µmhos/cm)	1127		1141		1121	
	Temperature (°C)	24.4	25.0	24.3	24.9	24.4	25.1
600 mg KCl/L	pH (S.U.)	8.04	7.81	7.98	7.74	7.98	7.62
	DO (mg/L)	~~8.5~~ 8.4	7.8	8.2	8.1	8.5	7.3
	Conductivity (µmhos/cm)	1391		1404		1403	
	Temperature (°C)	24.4	25.0	24.3	24.9	24.4	25.1
750 mg KCl/L	pH (S.U.)	8.05	7.82	8.00	7.80	7.98	7.65
	DO (mg/L)	8.4	7.8	8.2	8.1	8.5	7.2
	Conductivity (µmhos/cm)	1643		1661		1639	
	Temperature (°C)	24.4	25.0	24.3	24.9	24.4	25.1
900 mg KCl/L	pH (S.U.)	8.06	7.85	8.01	7.80	~~7.84~~	7.72
	DO (mg/L)	8.4	8.0	8.2	8.1	7.98 8.5	7.3
	Conductivity (µmhos/cm)	1835		1850		1861	
	Temperature (°C)	24.4	25.0	24.3	24.9	24.4	25.1
		Initial	Final	Initial	Final	Initial	Final

Stock 68500 69000 69800

PpKClCR Test Number: 36

centration	Parameter	Day 3		Day 4		Day 5		Day 6	
ONTROL	pH (S.U.)	7.97	7.50	7.87	7.50	7.84	7.78	7.96	7.77
	DO (mg/L)	8.1	7.3	7.8	7.0	7.8	7.9 7.4	7.9	7.9
	Conductivity (µmhos/cm)	312		301		304		314 ~~313~~	
	Temperature (°C)	24.6	24.8	24.2	25.2	24.7	24.7	24.6	25.3
mg KCl/L	pH (S.U.)	8.00	7.51	7.95	7.59	7.95	7.87	8.06	7.85
	DO (mg/L)	8.3	7.2	7.9	6.9	7.8	7.9 7.4	7.9	7.9
	Conductivity (µmhos/cm)	856		844		844		866	
	Temperature (°C)	24.6	24.8	24.2	25.2	24.7	24.7	24.6	25.3
mg KCl/L	pH (S.U.)	8.00	7.56	7.97	7.56	7.99	7.93	8.09	7.83
	DO (mg/L)	8.3	7.2	7.9	7.0	7.8	7.8 7.6	7.9	8.0
	Conductivity (µmhos/cm)	1126		1114		1117		1122	
	Temperature (°C)	24.6	24.8	24.2	25.2	24.7	24.7	24.6	25.3
mg KCl/L	pH (S.U.)	8.02	7.58	7.99	7.64	8.02	7.95	8.09	7.88
	DO (mg/L)	8.2	7.0	8.0	6.9	7.8	7.8	7.9	8.0
	Conductivity (µmhos/cm)	1398		1383		1381		1403	
	Temperature (°C)	24.6	24.8	24.2	25.2	24.7	24.7	24.6	25.3
mg KCl/L	pH (S.U.)	8.03	7.67	8.01	7.66	8.02	7.97	8.10	7.95
	DO (mg/L)	8.2	7.0	8.0	7.0	7.9	7.9	7.9	8.0
	Conductivity (µmhos/cm)	1624		1632		1634		1656	
	Temperature (°C)	24.6	24.8	24.2	25.2	24.7	24.7	24.6	25.3
mg KCl/L	pH (S.U.)	8.64	7.74	8.03	7.69	8.04	8.02	8.10	7.95
	DO (mg/L)	8.3	7.1	8.0	7.0	7.9	8.0	8.0	8.0
	Conductivity (µmhos/cm)	1859		1856		1865		1891	
	Temperature (°C)	24.6	24.8	24.2	25.2	24.7	24.7	24.6	25.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
Stock		66900		66700		67300		68700	

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Environmental Testing Solutions, LLC

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

Test number	Test date	7-d IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	Control Limits CT - 2S	Control Limits CT + 2S	$S_{A.10}$	Warning Limits CT - $S_{A.10}$	Warning Limits CT + $S_{A.10}$	$S_{A.25}$	Control Limits CT - $S_{A.25}$	Control Limits CT + $S_{A.25}$	CV
1	03-07-01	1 04											
2	04-04-01	1.02	1 03	0 01	1 01	1 06	0 08	0 95	1.11	0 18	0.86	1.20	0 01
3	05-09-01	1.10	1 05	0 04	0.97	1.14	0 08	0 97	1.13	0.18	0.88	1.22	0 04
4	06-06-01	1 07	1 06	0 03	0 99	1.13	0 08	0 98	1 14	0.18	0 89	1.23	0 03
5	07-10-01	1 05	1 06	0 03	1 00	1.12	0 08	0 98	1.14	0.18	0 89	1.23	0 03
6	08-08-01	1 02	1 05	0 03	0 99	1.11	0 08	0 97	1.13	0.18	0 88	1.22	0 03
7	09-12-01	1 02	1 05	0 03	0 98	1.11	0 08	0 97	1.13	0.18	0 88	1.22	0 03
8	10-10-01	1 03	1 05	0 03	0 99	1.10	0 08	0 97	1.13	0.18	0 88	1.22	0 03
9	11-01-01	1 00	1 04	0 03	0 98	1.10	0 08	0 96	1.12	0 18	0 87	1.21	0 03
10	12-05-01	1 05	1 04	0 03	0 98	1.10	0 08	0 96	1.12	0 18	0 87	1.21	0 03
11	01-09-02	0 91	1 03	0 05	0 93	1 13	0 08	0 95	1.11	0 18	0 86	1.20	0 05
12	02-05-02	1 07	1 03	0 05	0 94	1.13	0 08	0.95	1.11	0.18	0 86	1.20	0 05
13	03-19-02	1 03	1 03	0 05	0 94	1 12	0 08	0 95	1.11	0 18	0 86	1.20	0 04
14	04-09-02	1 03	1.03	0 04	0.94	1.12	0 08	0 95	1.11	0.18	0 86	1.20	0.04
15	05-07-02	1 05	1 03	0 04	0 95	1.12	0 08	0 95	1.11	0.18	0 86	1.20	0 04
16	06-04-02	1 06	1 04	0 04	0 95	1 12	0 08	0 96	1.12	0.18	0 87	1.21	0 04
17	07-09-02	1.03	1 04	0 04	0 95	1.12	0 08	0 96	1.12	0.18	0 87	1.21	0 04
18	08-06-02	1.05	1 04	0 04	0 96	1.12	0 08	0 96	1.12	0.18	0 87	1.21	0 04
19	09-04-02	1 05	1 04	0 04	0 96	1 11	0 08	0 96	1.12	0.18	0 87	1.21	0 04
20	10-08-02	1 03	1 04	0 04	0 96	1.11	0 08	0 96	1.12	0.18	0 87	1.21	0 04

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.

$S_{A.10}$ = Standard deviation corresponding to the 10th percentile CV. $S_{A\,10}$ = 0 08, as determined by USEPA for the method and endpoint.

$S_{A.25}$ = Standard deviation corresponding to the 25th percentile CV $S_{A\,25}$ = 0 17, as determined by the USEPA for the method and endpoint.

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

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

USEPA Recommended Control and Warning Limits.

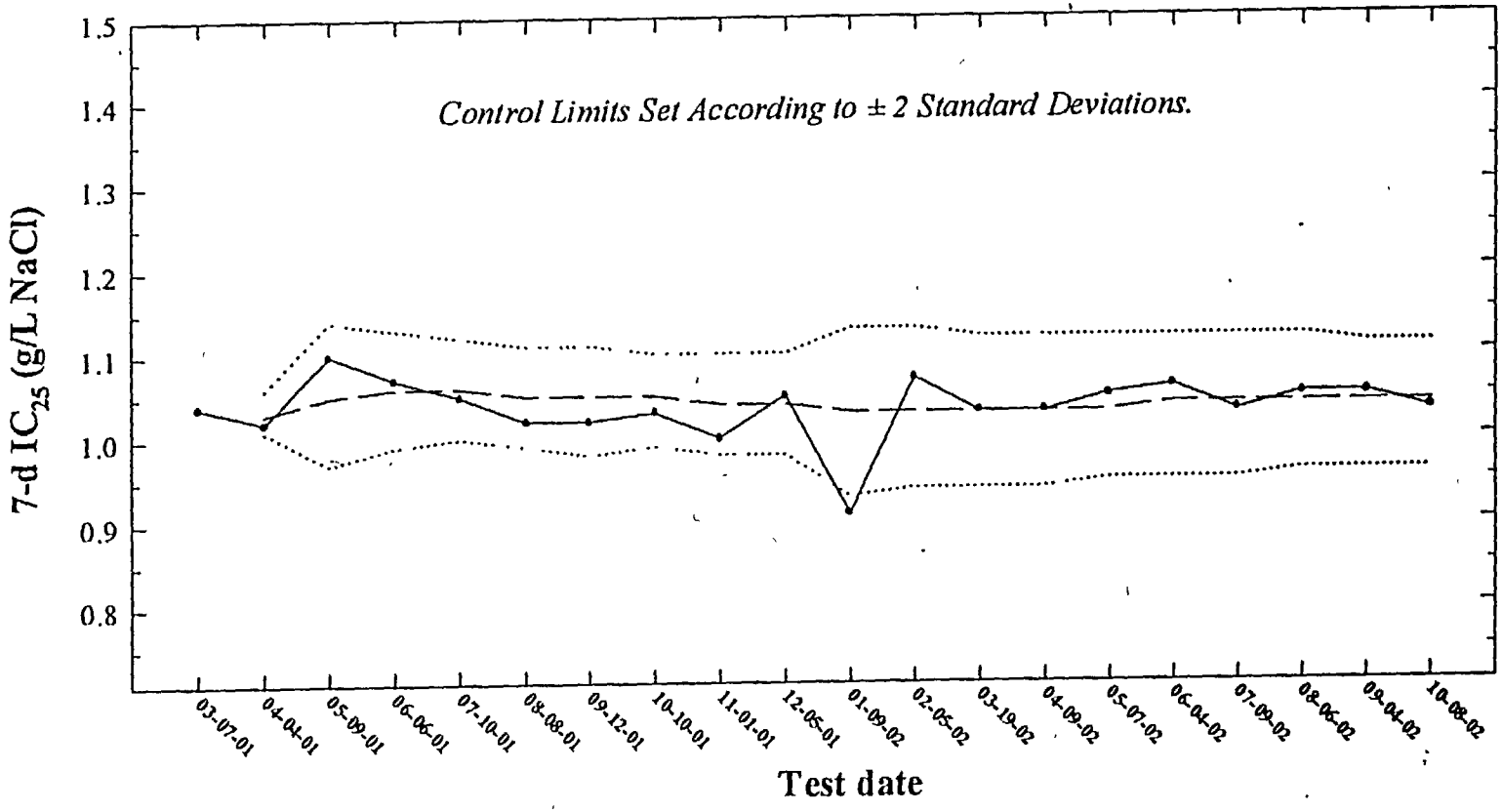
Warning Limit = Standard deviation corresponding to the 75th percentile CV. $S_{A\,75}$ = 0 45

Control Limit = Standard deviation corresponding to the 90th percentile CV. $S_{A\,90}$ = 0 62

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, LLC

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



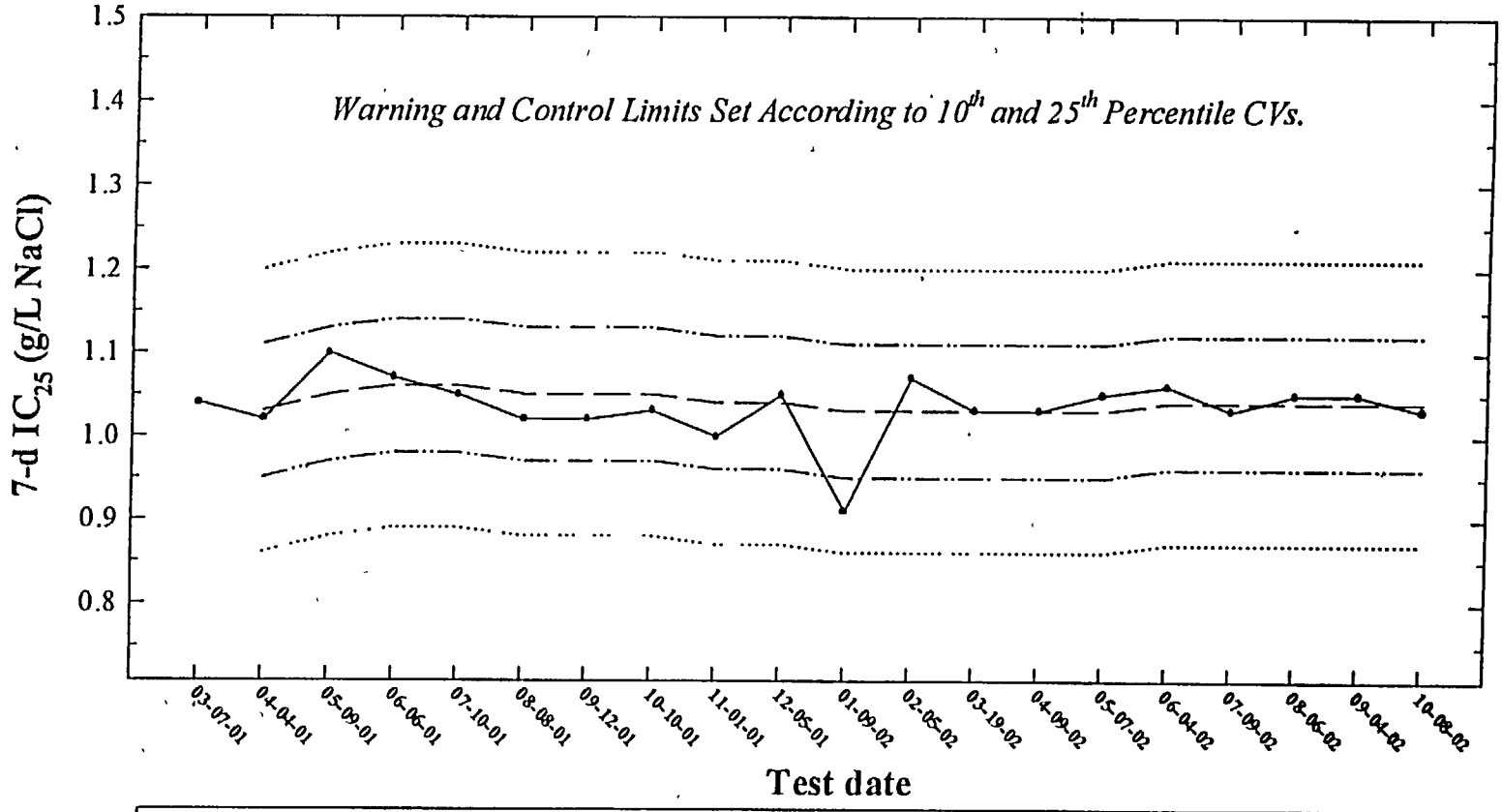
—•— 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

— – Central Tendency (mean IC_{25})

.. .. Control Limits (mean IC_{25} ± 2 Standard Deviations)

Environmental Testing Solutions, LLC

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



—•— 7-day IC_{25} = 25% inhibition concentration. An estimation of the concentration of sodium chloride that would cause a 25% reduction in *Ceriodaphnia* reproduction for the test population.

— – Central Tendency (mean IC_{25})

— · — Warning Limits (mean $IC_{25} \pm S_{A\,10}$, $S_{A\,10} = 0.08$, as determined by USEPA for the method and endpoint)

· ····· Control Limits (mean $IC_{25} \pm S_{A\,25}$, $S_{A.25} = 0.17$, as determined by USEPA for the method and endpoint)

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	03-07-01	100	24.0	8.3		2.4	10.1	
2	04-04-01	100	25.0	10.0	9.2	2.9	11.8	10.9
3	05-09-01	100	27.9	8.9	9.1	3.1	11.0	11.0
4	06-06-01	100	27.8	5.8	8.2	3.5	12.5	11.3
5	07-10-01	100	25.0	9.4	8.5	2.8	11.2	11.3
6	08-08-01	100	30.9	2.4	7.5	2.7	8.7	10.9
7	09-12-01	100	28.6	6.6	7.3	2.7	9.4	10.7
8	10-10-01	100	24.9	8.8	7.5	2.5	9.9	10.6
9	11-01-01	100	27.0	6.5	7.4	3.1	11.6	10.7
10	12-05-01	100	24 8	9.1	7.6	4.8	19.5	11.6
11	01-09-02	100	27.5	7.5	7.6	4.5	16 3	12.0
12	02-05-02	100	23.1	10.1	7.8	2.6	11.1	11.9
13	03-19-02	100	26.3	8.6	7.8	3.0	11.2	11.9
14	04-09-02	100	26.2	12.3	8.2	2.8	10.7	11.8
15	05-07-02	100	27.3	8.1	8.2	2.3	8.4	11.6
16	06-04-02	100	26.0	9.9	8.3	3.8	14.7	11.8
17	07-09-02	100	29.5	8.0	8.3	3.5	11.7	11.8
18	08-06-02	100	28.4	10.4	8.4	2.7	9.5	11.6
19	09-04-02	100	31.4	6.7	8.3	3.0	9.5	11.5
20	10-08-02	100	31.1	9.2	8.3	2.9	9.4	11.4

Note

Average control reproduction (offspring per female) = 27.1

CV = Coefficient of variation for control reproduction.

On average, the CV for control reproduction is 8.3% in Environmental Testing Solutions, LLC

Lower CV bound determined by USEPA (10th percentile) = 8.9%.

Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 11.4% from the control.

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

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

CT = Central Tendancy (mean Control Reproduction CV or mean PMSD)

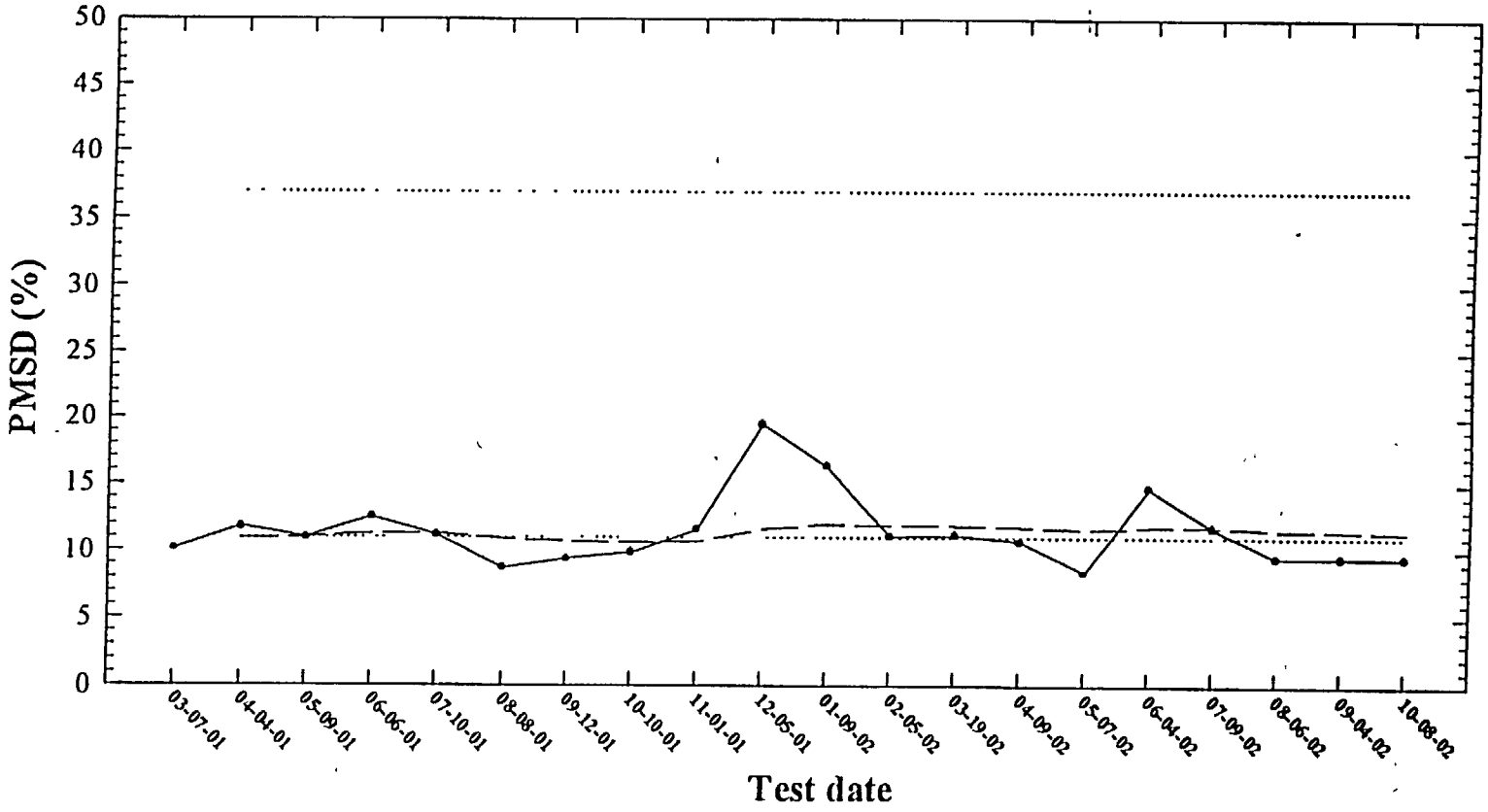
The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for Ceriodaphnia reproduction in chronic reference toxicant tests

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

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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



—•— PMSD = percent minimum significant difference. PMSD is the minimum significant difference between the control and treatment that can be declared statistically significant.

— - Central Tendency (mean PMSD)

· · Lower and Upper PMSD Bounds

Lower PMSD Bound (10th percentile) = 11%, Upper PMSD Bound (90th percentile) = 37%

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

Sodium Chloride Chronic Reference Toxicant Test
(EPA/600/4-91/002 Method 1002.0)
Species: *Ceriodaphnia dubia*

CdNaClCR Test Number: 27

	Date	Time	Analyst
Test start	10.08.02	1116	JH
Test end	10-15-02	1037	JH

Dilution preparation information:						*Comments:*
NaCl CHM number:	CHM 10160					
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	

Test organism information:		*Test information:*	
Organism age:	<24 hours old	Randomizing template:	Blue
Date and times organisms were born between:	10-07-02 1519 to 1809	Incubator number:	2
Organism source:	10.01.02 A+B	YCT batch: A&B	10.01.02
Transfer bowl information:	pH = 8.09 Temperature (°C)= 25.0	*Selenastrum* batch: A&B	10.01.02

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	4	5	4	5	5	3	4	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	13	12	12	12	14	11	12	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	13	13	17	14	0	13	16	16	18
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	15	0	0	0	0
Total young produced		27	28	30	34	31	30	31	31	32	37
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

Calculations and data reviewed: JH

Test Renewal, Feeding, and Randomization Record Label

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	10-14	10-08	10-09	10-10	10-11	10-12	10-13
Time	1052	1116	1053	1030	1137	1132	1127
Analyst	JH	JH	JH	KEK	JH	JH	JH
Shelf Location	B1	B1	B1	B1	B1	B1	B1

Control information:		Acceptance criteria	*Summary of test endpoints* (mg NaCl/L):	
% of Male Adults:	0%	≤ 20%	7-day LC50	>1400
% Adults having 3rd Broods	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	31.1	≥ 15.0 offspring/female	ChV	894.4
% CV:	9.2%	< 40.0 %	IC25	1026.9

CdNaClCR Test Number: 27

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	4	4	5	4	4	4	5	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	10	13	14	10	13	14	12	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	17	14	14	12	1	14	0	0	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	16	0	15	14	0
Total young produced		28	33	29	31	30	31	32	32	30	33
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.9
% Reduction from Control:	0.67%

Calculations and data reviewed: JH

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	5	3	5	5	4	3	5	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	11	15	14	12	10	12	13	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	16	1	14	15	2	16	0	12	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	14	0	0	10	0	15	0	10	12
Total young produced		32	28	30	35	30	31	~~32~~ 27	27	31	25
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

10-26-02 JH

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.6
% Reduction from Control:	4.87%

Calculations and data reviewed: JH

CdNaClCR Test Number: 27

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	5	4	4	4	3	3	5	3	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	1	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	12	13	8	10	10	8	8	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	0	11	12	1	13	11	0	0	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	12	0	0	8	0	0	16	12	0
Total young produced		25	26	27	30	19	26	26	27	24	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	26.0
% Reduction from Control:	16.4%

Calculations and data reviewed: JH

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	6.1
% Reduction from Control:	80.4%

Calculations and data reviewed: JH

CdNaClCR Test Number: 27

1400 mg NaCl/L

Survival and Reproduction Data

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

Concentration:	
% Mortality:	20%
Mean Offspring/Female:	2.2
% Reduction from Control:	92.9%

Calculations and data reviewed: JH

Environmental Testing Solutions, LLC

Chronic Whole Effluent Toxicity Test (EPA/600/4-91/002, Method 1002.0)
Species: Ceriodaphnia dubia

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

Test number: CdNaClCR #27

Test dates: October 8-15, 2002

Reviewed by: [signature]

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	27	28	30	34	31	30	31	31	32	37	100	31.1	9.2	Not applicable
600	28	33	29	31	30	31	32	32	30	33	100	30.9	5.4	0.6
800	32	28	30	35	30	31	30	27	31	25	100	29.9	9.3	3.9
1000	25	26	27	30	19	26	26	27	24	30	100	26.0	12.0	16.4
1200	3	4	7	12	6	9	12	1	3	4	100	6.1	63.0	80.4
1400	6	0	0	0	4	5	4	0	0	3	80	2.2	110.9	92.9

Dunnett's MSD value: 2.923

PMSD: 9.4

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 11.4% from the control

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

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

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

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

Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	10/8/02	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	10/15/02	Lab ID:	ETS-Env. Testing Solutions	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol	EPAF 91-EPA Freshwater	Test Species	CD-Ceriodaphnia dubia
Comments					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	27 000	28 000	30 000	34 000	31.000	30.000	31.000	31 000	32.000	37.000
600	28.000	33 000	29 000	31 000	30.000	31.000	32.000	32.000	30 000	33.000
800	32.000	28.000	30.000	35.000	30 000	31 000	30.000	27.000	31.000	25.000
1000	25 000	26 000	27.000	30.000	19 000	26 000	26 000	27.000	24.000	30.000
1200	3.000	4.000	7 000	12.000	6 000	9.000	12.000	1 000	3.000	4.000
1400	6 000	0 000	0 000	0.000	4.000	5.000	4.000	0 000	0 000	3.000

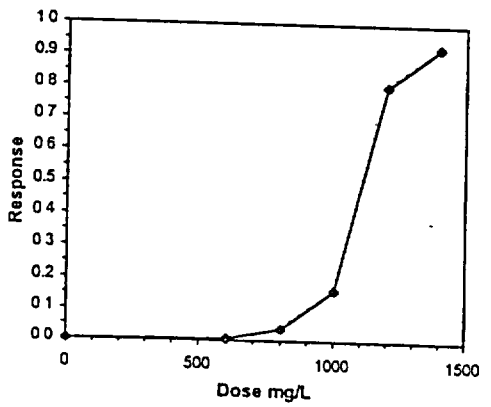
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	31 100	1.0000	31.100	27 000	37 000	9 151	10				31 100	1.0000
600	30.900	0 9936	30 900	28 000	33 000	5.383	10	0.156	2.287	2.923	30.900	0 9936
800	29 900	0 9614	29 900	25 000	35.000	9.254	10	0 939	2.287	2.923	29 900	0 9614
*1000	26 000	0 8360	26 000	19 000	30 000	12.027	10	3 990	2.287	2.923	26 000	0 8360
*1200	6 100	0 1961	6 100	1.000	12.000	62.996	10	19.557	2.287	2 923	6 100	0 1961
*1400	2.200	0.0707	2.200	0 000	6 000	110 927	10	22.608	2.287	2.923	2.200	0.0707

Auxiliary Tests		Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0 01)		0 735521972	1 035	0.130465747	0 157285946
Bartlett's Test indicates equal variances (p = 0 30)		6 050591469	15 08631706		

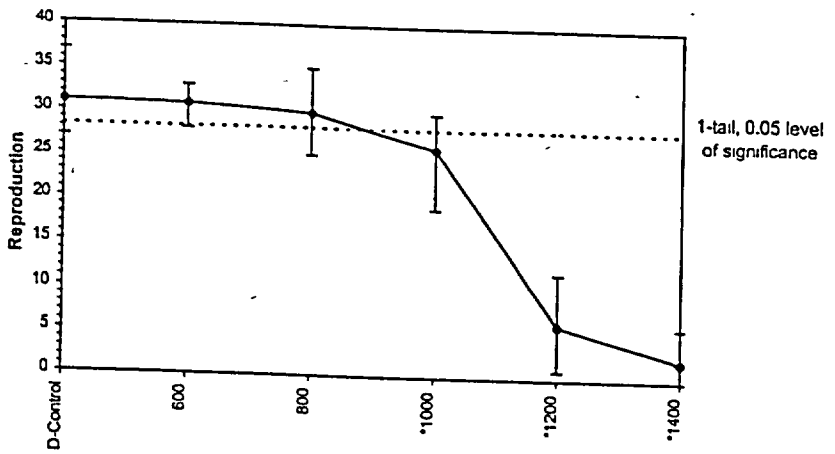
Hypothesis Test (1-tail, 0 05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894 427191		2.923066691	0 093989283	1759.346667	8 17037037	2.3E-34	5, 54

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	818.2051282	89 1717353	583 6076555	873.3362691	-1 4549
IC10	897 9487179	54 19916836	767.2638889	961 7269737	-0 8484
IC15	977 6923077	39 31064085	875 7670773	1009 83257	-0 9661
IC20	1011.256281	15 76437826	953 7145833	1024 769496	-2.2154
IC25	1026 884422	9 011151569	1006 663923	1039 706422	-0.2877
IC40	1073 768844	7 68929744	1058 848531	1088.553333	-0 0946
IC50	1105 025126	7 757888513	1091 412451	1122.229167	0 0342



Dose-Response Plot



CdNaClCR Test Number: 27

MHS Control Chemistry:

Parameter	Control Batch:		
	10-07-02	10-09-02	10-11-02
pH (S.U.)	7.82	7.87	7.96
DO (mg/L)	7.8	7.8	7.9
Conductivity (µmhos/cm)	294	301	~~313~~ 314
Alkalinity (mg $CaCO_3$/L)	61	62	60
Hardness (mg $CaCO_3$/L)	82	86	82

Acceptance Criteria for Daily Chemistry:

Concentration	Acceptance Criteria (dilutions must be remade if the conductivity falls outside the acceptable range)
CONTROL	280 - 360
600 mg NaCl/L	1390 - 1590
800 mg NaCl/L	1780 - 1970
1000 mg NaCl/L	2190 - 2370
1200 mg NaCl/L	2550 - 2740
1400 mg NaCl/L	2910 - 3160
NaCl Stock	110500 - 116300

CdNaClCR Test Number: 27

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	7.82	7.84	7.71	7.86	7.92	7.95
	DO (mg/L)	7.8	8.1	8.1	8.3	8.4	8.1
	Conductivity (µmhos/cm)	294		302		314	
	Temperature (°C)	24.4	24.9	24.2	25.2	24.4	24.9
600 mg NaCl/L	pH (S.U.)	8.01	7.87	7.94	7.98	8.04	8.05
	DO (mg/L)	8.2	8.1	8.3	8.3	8.1	8.1
	Conductivity (µmhos/cm)	1489		1512		1556	
	Temperature (°C)	24.4	24.9	24.2	25.2	24.4	24.9
800 mg NaCl/L	pH (S.U.)	8.03	7.87	7.96	7.96	8.05	8.05
	DO (mg/L)	8.4	8.1	8.3	8.3	8.1	8.1
	Conductivity (µmhos/cm)	1817		1829		1853	
	Temperature (°C)	24.4	24.9	~~25~~ 24.2	25.2	24.4	24.9
1000 mg NaCl/L	pH (S.U.)	8.04	7.89	7.96	7.97	8.04	8.07
	DO (mg/L)	8.5	8.1	8.3	8.3	8.2	8.1
	Conductivity (µmhos/cm)	2200		2202		2260	
	Temperature (°C)	24.4	24.9	24.2	25.2	24.4	24.9
1200 mg NaCl/L	pH (S.U.)	8.03	7.90	7.96	8.00	8.04	8.04
	DO (mg/L)	8.6	8.2	8.3	8.3	8.3	8.2
	Conductivity (µmhos/cm)	2560		2565		2630	
	Temperature (°C)	24.4	24.9	24.2	25.2	24.4	24.9
1400 mg NaCl/L	pH (S.U.)	8.04	7.90	7.98	7.99	8.04	8.06
	DO (mg/L)	8.6	8.2	8.4	8.4	8.3	8.2
	Conductivity (µmhos/cm)	2930		2919		2990	
	Temperature (°C)	24.4	24.9	24.2	25.2	24.4	24.9
		Initial	Final	Initial	Final	Initial	Final
	Stock	108900		108200		111100	

CdNaClCR Test Number: 27

centration	Parameter	Day 3 Initial	Day 3 Final	Day 4 Initial	Day 4 Final	Day 5 Initial	Day 5 Final	Day 6 Initial	Day 6 Final
NTROL	pH (S.U.)	7.97	7.95	7.87	7.91	7.84	8.05	7.96	7.87
	DO (mg/L)	8.1	7.8	7.8	7.9	7.8	8.1	7.9	7.9
	Conductivity (µmhos/cm)	312		301		304		314	
	Temperature (°C)	24.6	25.1	24.2	24.9	24.7	24.9	24.6	25.1
mg NaCl/L	pH (S.U.)	8.00	8.09	8.00	8.00	8.02	8.08	8.04	7.98
	DO (mg/L)	8.1	8.0	8.0	7.9	7.8	8.1	7.8	7.8
	Conductivity (µmhos/cm)	1525		1526		1475		1507	
	Temperature (°C)	24.6	25.1	24.2	24.9	24.7	24.9	24.6	25.1
mg NaCl/L	pH (S.U.)	8.02	8.09	8.04	8.03	8.02	8.07	8.06	8.01
	DO (mg/L)	8.0	8.0	8.0	8.0	7.9	8.1	7.8	7.9
	Conductivity (µmhos/cm)	1842		1833		1824		1835	
	Temperature (°C)	24.6	25.1	24.2	24.9	24.7	24.9	24.6	25.0
00 mg NaCl/L	pH (S.U.)	8.03	8.11	8.05	8.05	8.03	8.10	8.07	8.02
	DO (mg/L)	8.1	8.0	8.0	8.0	8.0	8.2	7.8	8.0
	Conductivity (µmhos/cm)	2232		2203		2234		2262	
	Temperature (°C)	24.6	25.1	24.2	24.9	24.7	24.9	24.6	25.0
00 mg NaCl/L	pH (S.U.)	8.04	8.09	8.06	8.03	8.04	8.11	8.07	8.03
	DO (mg/L)	8.2	8.0	8.0	8.1	8.0	8.3	8.0	8.0
	Conductivity (µmhos/cm)	~~2896~~ 2596		2570		2570		2606	
	Temperature (°C)	24.6	25.1	24.2	24.9	24.7	24.9	24.6	25.0
00 mg NaCl/L	pH (S.U.)	8.05	8.09	8.07	8.04	8.05	8.15	8.08	8.02
	DO (mg/L)	8.2	8.1	8.1	8.2	8.0	8.4	7.9	8.0
	Conductivity (µmhos/cm)	2959		2917		2927		2969	
	Temperature (°C)	24.6	25.1	24.2	24.9	24.7	24.9	24.6	25.0

Stock 107500 106800 106700 108600

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location If Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Jerry D. Osborne

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	02	10	01	To	02	10	31

MAJOR
(SUBR 01)
F - FINAL
LOW VOL. WASTE TREATMENT POND
EFFLUENT
*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE. Read instructions before completing this form

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	8.9	(12)	0	13 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	115	149	(26)	********	13	17	(19)	0	5 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<44	<48	(26)	********	<5	<5	(19)	0	5 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.137	1.343	(03)	********	********	********	**	0	31 / 31	TOTAL
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		DAILY	TOTAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7630	02	11	14
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 BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN Jerry D. Osborne

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	02	10	01	To	02	10	31

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
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			(03)	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7630	02	11	14
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No phosphate bearing chemicals were employed No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Jerry D Osborne

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	02	10	01	To	02	10	31

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

*** NO DISCHARGE XX ***

Form Approved
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED			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 BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY IN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Jerry D. Osborne

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	02	10	01	To	02	10	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No 2040-0004

NOTE. Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	(00)	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7630	02	11	14
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Operations is required once per shift to perform visual inspections.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN. Jerry D. Osborne

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	02	10	01	To	02	10	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved
OMB No. 2040-0004

NOTE: Read Instructions before completing this form

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	(00)	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here*
Operations is required once per shift to perform visual inspections.

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

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

ATTN Jerry D Osborne

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	02	10	01	To	02	10	31

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

*** NO DISCHARGE [XX] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Richard T. Purcell Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations	Environmental Supervisor SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7630	02	11	14
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.