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

April 11, 2002

State of Tennessee
Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street, 6th Floor Annex
Nashville, Tennessee 37243-1534

Attention: Ms. Evelyn Haskin, Enforcement & Compliance

Dear Ms. Haskin:

TENNESSEE VALLEY AUTHORITY - DISCHARGE MONITORING REPORT FOR SEQUOYAH NUCLEAR PLANT

Please find enclosed the Discharge Monitoring Report (DMR) of March 2002 for Sequoyah. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Diedre B. Nida

Diedre B. Nida
Environmental Supervisor
Signatory Authority
for Richard T. Purcell
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

I625

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: Diedre B. Nida

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	03	01	To	02	03	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	********	********	**	********	********	15.6	(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	********	********	**	********	********	28.5	(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	********	********	**	7.6	********	7.8	(12)	0	8 / 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	12	(19)	0	4 / 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	4 / 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	********	1649	(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	********	********	**	********	<0.006	0.014	(19)	0	43 / 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	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.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	04	11
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following injections occured: 1. PCL-222 (max. calc. conc. was 0.024mg/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 0.025mg/L--limit 0.100mg/L)

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DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	03	01	To	02	03	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
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		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.3	(62)	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG C /HR			CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	3.2	(04)	0	31 / 31	CALCTD
00016 1 W 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	5.0	DEG. C.			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			GRAB
	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.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	04	11
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COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here*

CCW data for March 2002 is attached.

CCW Data for March 2002

CCW CHANNEL

DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
March 13, 2002	< 0.5	

CCW TRENCH DISCHARGE

DATE	EXTRACTABLE PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
March 13, 2002	1.0	

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DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

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MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
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	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.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	04	11
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled from February 24, 2002 through March 1, 2002. Report is attached.

April 3, 2002

Diedre B. Nida, SB 2A-SQN

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

Attached are two copies of the subject report for submission to the state of Tennessee. The report provides results of compliance testing using fathead minnows. A copy of the report is included for your records.

Outfall 101 samples collected February 24-March 1, 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 since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results indicate that fish pathogen interference is likely the cause of historic problems with WET tests for this effluent.

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 february 2002m-jm

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION/EXECUTIVE SUMMARY

1) Facility/Discharger: Sequoyah Nuclear Plant/TVA Report Date: April 3, 2002

2) County/State: Hamilton / Tennessee 3) NPDES Permit #: TN0026450

4) Type of Facility: Nuclear-fueled electric generating plant

5) Design Flow (MGD): 3,266

6) Receiving Stream: Tennessee River (TRM 483.6)

7) 1Q10: 2,992.4

8) Outfall Tested: 101 9) Dates Sampled: February 24- March 1, 2002

10) Flow on day(s) sampled (MGD): 1624, 1614, 1569

11) Pertinent site conditions: No unusual conditions reported. *

12) Test Dates: February 26-March 5, 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: Diedre B. Nida 19) Phone #: (423) 843-6700

20) Consultant/Testing Lab Name: Environmental Testing Solutions, LLC

21) Lab Contact: Jim Sumner 22) Phone #: (828) 862-8193
TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755

*Production/operation data will be provided upon request.

Notes: Outfall 101 samples collected February 24-March 1, 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.

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METHODS SUMMARY

Samples

1) Sampling Point: Outfall 101

2) Sample Type: Composite

3) Sample Information:

Sample ID	Date/Time Collected (MM-DD-YY/Time)	Date/Time Received (MM-DD-YY/Time)	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date/Time Used (MM-DD-YY/Time)
101	02-24-02/1454 & 1518 02-25-02/1354 & 1418	02-26-02/1105	0.9	<0.10	02-26-02/1522 02-27-02/1514
Intake	02-24-02/1539 02-25-02/1439	02-26-02/1105	0.6	<0.10	02-26-02/1522 02-27-02/1514
101	02-26-02/1026 02-27-02/0926	02-28-02/1045	0.2	<0.10	02-28-02/1516 03-01-02/1500
Intake	02-26-02/1038 02-27-02/0938	02-28-02/1045	0.7	<0.10	02-28-02/1516 03-01-02/1500
101	02-28-02/1335 03-01-02/1235	03-02-02/1058	0.6†	<0.10	03-02-02/1506 03-03-02/1453 03-04-02/1456
Intake	02-28-02/1405 03-01-02/1305	03-02-02/1058	1.1	<0.10	03-02-02/1506 03-03-02/1453 03-04-02/1456

*Total residual chlorine.
†Collected in two 2.5-gallon cubitainers. Temperature was measured in each cubitainer upon arrival.

4) Sample manipulation:

Routine samples from Outfall 101 and intake were warmed to test temperature (25.0 ±1.0°C) in a warm water bath.

Aliquots of Outfall 101 and intake samples used for the side by side UV treated test were warmed to 24°C in a warm water bath and held in a 40Watt Rainbow Lifeguard UV Sterilizer for 2 minutes, prior to exposure of test organisms.

Test Organisms

	Pimephales promelas	*Ceriodaphnia dubia*
1) Source:	Aquatic BioSystems, Inc.	In-house culture
2) Age:	23 hours	< 24 hours

Test Method Summary (See Appendix A for additional information)

	Pimephales promelas	*Ceriodaphnia dubia*
1) Test Conditions	Static, renewal	Static, renewal
2) Test Duration	7 days	Until at least 60% of control females have 3 broods
3) Dilution/Control Water	Moderately Hard Synthetic Water	Moderately Hard Synthetic Water
4) Number Replicates	4	10
5) Animals per Replicate	10	1
6) Test Initiation: (Date/Time)		
Outfall 101	02/26/02-1438 EST	02/26/02-1522 EST
UV Treated Outfall 101	02/26/02-1438 EST	
7) Test Termination: (Date/Time)		
Outfall 101	03/05/02-1430 EST	03/05/02-1520 EST
UV Treated Outfall 101	03/05/02-1430 EST	
8) Test Temperature: Outfall 101	Mean =24.6 °C (24.1-25.2°C)	Mean = 24.6°C (24.2-25.3°C)
Test Temperature: UV-Treated Outfall 101	Mean = 24.7°C (24.2-25.5°C)	

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

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

TOXICITY TEST RESULTS (See Appendix C for Bench Sheets)

1) Results of a *Pimephales* *promelas* Chronic7-d Toxicity Test
(Genus) (Species) (Type/Duration)

Conducted 02/26/02 03/05/02 Using Effluent From Outfall 101
(mm/dd/yy) (mm/dd/yy) (number)

Test Solutions	Percent Surviving (time intervals used - days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98% Effluent	100	100	100	100	95	92	87
22% Effluent	100	100	100	100	100	100	100
43.9% Effluent	100	100	100	100	100	100	100
72% Effluent	100	100	100	100	100	100	98
100% Effluent	100	100	100	100	95	95	93
Intake	100	100	100	100	100	100	100

Test Solutions	IC_{25} Mean Dry Weight (mg) (Replication)				
	1	2	3	4	Mean
Control	0.702	0.646	0.618	0.494	0.615
10.98% Effluent	0.555	0.597	0.611	0.330	0.523
22% Effluent	0.580	0.551	0.522	0.535	0.547
43.9% Effluent	0.571	0.530	0.626	0.543	0.568
72% Effluent	0.579	0.619	0.693	0.560	0.613
100% Effluent	0.685	0.626	0.652	0.387	0.587
Intake	0.537	0.682	0.525	0.591	0.583

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

†TUc = 100/ IC_{25}

TOXICITY TEST RESULTS (continued)

2) Results of a *Ceriodaphnia* (Genus) *dubia* (Species) Chronic 3-brood (Type/Duration) Toxicity Test

Conducted 02/26/02 (mm/dd/yy) 03/05/02 (mm/dd/yy) Using Effluent From Outfall 101. (number)

Test Solutions	Percent Surviving (time intervals used - days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
6.25% Effluent	100	100	100	100	100	100	100
12.5% Effluent	100	100	100	100	100	100	100
25% Effluent	100	100	100	100	100	100	100
50% Effluent	100	100	100	100	100	100	100
100% Effluent	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions	Reproduction (#young/female/7 days) Data Replicates										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	22	25	26	23	24	22	26	21	20	25	23.4
10.98% Effluent	21	22	23	23	23	24	22	23	28	24	23.3
22% Effluent	26	24	24	23	24	21	25	25	23	27	24.2
43.9% Effluent	28	23	26	26	29	22	24	22	28	27	25.5
72% Effluent	26	30	26	30	26	28	27	30	31	28	28.2
100% Effluent	31	32	27	29	28	31	30	29	27	28	29.2
Intake	26	27	28	27	30	29	31	23	31	30	28.2

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

† TUc = 100/ IC_{25}

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	02/26/02	1438	7-days	KCl	561.38 mg/L (IC_{25})
Ceriodaphnia dubia	02/05/02	1337	7-days	NaCl	1072.5 mg/L (IC_{25})

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

1) Results of a *Pimephales* *promelas* (Genus) (Species) Chronic7-d (Type/Duration) Toxicity Test

Conducted 02/26/02 (mm/dd/yy) 03/05/02 (mm/dd/yy) Using Effluent From Outfall 101, UV treated. (number)

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

Test Solutions	IC_{25} Mean Dry Weight (mg) (Replication)				
	1	2	3	4	Mean
Control	0.525	0.476	0.472	0.433	0.476
10.98% Effluent	0.493	0.520	0.559	0.584	0.539
22% Effluent	0.487	0.455	0.486	0.621	0.512
43.9% Effluent	0.716	0.493	0.510	0.542	0.565
72% Effluent	0.611	0.579	0.465	0.503	0.540
100% Effluent	0.501	0.511	0.516	0.595	0.531
Intake	0.558	0.587	0.541	0.522	0.552

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

† TUc = 100/ IC_{25}

SUMMARY/CONCLUSIONS

Outfall 101 samples collected February 24-March 1, 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 since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah. Although dose response and survival in the routine compliance test were not impacted enough to jeopardize test acceptability or compliance with permit limits during this study, survival was improved by two minute exposure of samples to UV light prior to introduction of test organisms. These results indicate that fish pathogen interference is likely the cause of historic problems with WET tests for this effluent.

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

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

3) Temperature was measured 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 120.1.

7) Alkalinity was measured using EPA 310.1.

8) Hardness was measured EPA Method 130.2.

9) Total residual chlorine was measured using EPA 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 D for control chart information)

1) Test Type: 7-day chronic tests with results expressed as IC_{25} values in g KCl.

2) Standard Toxicant: Potassium Chloride (KCl crystalline).

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
February 26- March 5, 2002

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-March 1, 2002

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-March 1, 2002

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-March 1, 2002

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
1/02/2002	-	< 0.0079	0.023	0.02	0.006	-	-
1/03/2002	-	< 0.0042	0.023	0.014	-	-	-
1/04/2002	-	0.0124	0.024	0.014	0.009	-	-
1/05/2002	-	< 0.0042	-	-	-	-	-
1/06/2002	-	< 0.0042	-	-	-	-	-
1/07/2002	-	< 0.0089	0.024	0.014	0.006	-	-
2/24/2002	-	< 0.004	-	-	-	-	-
2/25/2002	-	< 0.004	0.023	0.023	-	-	-
2/26/2002	-	0.0143	0.023	0.023	0.007	-	-
2/27/2002	-	< 0.0041	0.023	0.023	-	-	-
2/28/2002	-	< 0.0041	0.024	0.008	-	-	-
3/01/2002	-	<0.0041	0.024	0.008	-	-	-

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, February 26- March 05, 2002

Test/ Sample ID	Temperature Initial (°C)	Temperature Final (°C)	Dissolved Oxygen Initial (mg/L)	Dissolved Oxygen Final (mg/L)	pH Initial S.U.	pH Final S.U.	Conductance Initial (µmhos)	Alkalinity mg/L $CaCO_3$	Hardness mg/L $CaCO_3$	Total Residual Chlorine (mg/L)
Fathead/ Control	24.6 (24.3-25.0)	24.4 (24.2-24.7)	8.0 (7.6-8.2)	7.4 (7.0-7.8)	8.10 (8.08-8.11)	7.86 (7.65-8.02)	315 (309-323)	67 (65-69)	86 (86-86)	-
Fathead/ 10.98 %	24.7 (24.4-25.0)	24.4 (24.2-24.7)	8.0 (7.8-8.1)	7.4 (6.5-7.9)	8.10 (8.08-8.12)	7.81 (7.52-8.00)	308 (302-322)	-	-	-
Fathead/ 22 %	24.7 (24.4-24.9)	24.4 (24.2-24.7)	8.0 (7.9-8.2)	7.4 (6.4-7.9)	8.09 (8.06-8.12)	7.80 (7.50-8.00)	295 (289-307)	-	-	-
Fathead/ 43.9 %	24.8 (24.5-25.0)	24.4 (24.2-24.7)	8.1 (8.0-8.3)	7.4 (6.5-7.9)	8.04 (7.98-8.08)	7.78 (7.49-7.95)	264 (260-272)	-	-	-
Fathead/ 72 %	24.8 (24.4-25.1)	24.4 (24.1-24.7)	8.2 (8.0-8.5)	7.4 (6.4-7.9)	7.98 (7.88-8.03)	7.76 (7.46-7.95)	223 (220-228)	-	-	-
Fathead/ 100 %	24.9 (24.5-25.2)	24.4 (24.2-24.7)	8.3 (8.1-8.6)	7.4 (6.9-7.7)	7.90 (7.75-7.99)	7.74 (7.48-7.94)	180 (177-183)	55 (54-56)	69 (66-70)	<0.10 (<0.10-<0.10)
Fathead/ Intake	24.8 (24.3-25.2)	24.4 (24.2-24.7)	8.3 (8.1-8.6)	7.5 (7.2-7.8)	7.88 (7.73-7.99)	7.77 (7.47-8.01)	177 (175-182)	56 (54-59)	70 (66-76)	<0.10 (<0.10-<0.10)
Daphnid/ Control	24.5 (24.3-24.7)	24.4 (24.2-24.6)	8.0 (7.6-8.2)	8.1 (8.0-8.2)	8.10 (8.08-8.11)	8.12 (8.07-8.17)	315 (309-323)	67 (65-69)	86 (86-86)	-
Daphnid/ 10.98 %	24.6 (24.5-24.9)	24.4 (24.2-24.6)	8.0 (7.8-8.1)	8.1 (8.0-8.2)	8.10 (8.08-8.12)	8.13 (8.07-8.18)	308 (302-322)	-	-	-
Daphnid/ 22 %	24.6 (24.4-24.9)	24.4 (24.2-24.6)	8.0 (7.9-8.2)	8.1 (8.0-8.2)	8.09 (8.06-8.12)	8.13 (8.07-8.14)	295 (289-307)	-	-	-
Daphnid/ 43.9	24.7 (24.4-25.0)	24.4 (24.2-24.6)	8.1 (8.0-8.3)	8.2 (8.1-8.2)	8.04 (7.98-8.08)	8.13 (8.06-8.20)	264 (260-272)	-	-	-
Daphnid/ 72	24.8 (24.5-25.0)	24.4 (24.2-24.6)	8.2 (8.0-8.5)	8.2 (8.0-8.3)	7.98 (7.88-8.03)	8.08 (7.99-8.14)	223 (220-228)	-	-	-
Daphnid/ 100 %	24.8 (24.6-25.0)	24.4 (24.2-24.6)	8.3 (8.1-8.6)	8.2 (8.0-8.4)	7.90 (7.75-7.99)	8.02 (7.90-8.10)	180 (177-183)	55 (54-56)	69 (66-70)	<0.10 (<0.10-<0.10)
Daphnid/ Intake	24.8 (24.4-25.3)	24.4 (24.2-24.6)	8.3 (8.1-8.6)	8.2 (8.0-8.3)	7.88 (7.73-7.99)	8.11 (7.99-8.22)	177 (175-182)	56 (54-59)	70 (66-76)	<0.10 (<0.10-<0.10)

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* Test, Sequoyah Nuclear Plant (SQN), UV Treated Outfall 101 and Intake Samples, February 26- March 5, 2002

Test/ Sample ID	Temperature Initial (°C)	Temperature Final (°C)	Dissolved Oxygen Initial (mg/L)	Dissolved Oxygen Final (mg/L)	pH Initial S.U.	pH Final S.U.	Conductance Initial (µmhos)	Alkalinity mg/L $CaCO_3$	Hardness mg/L $CaCO_3$	Total Residual Chlorine (mg/L)
Fathead/ Control	24.6 (24.3-24.9)	24.4 (24.2-24.7)	7.9 (7.6-8.1)	7.4 (6.8-8.0)	8.01 (7.93-8.11)	7.86 (7.60-7.99)	319 (308-340)	67 (65-69)	86 (86-86)	-
Fathead/ 10.98 %	24.8 (24.4-25.0)	24.4 (24.2-24.7)	7.9 (7.6-8.1)	7.4 (6.7-7.9)	8.04 (7.95-8.11)	7.85 (7.59-7.98)	310 (304-324)	-	-	-
Fathead/ 22 %	24.9 (24.3-25.2)	24.4 (24.2-24.6)	7.9 (7.6-8.2)	7.4 (6.6-7.9)	8.05 (7.96-8.11)	7.82 (7.58-7.96)	295 (289-306)	-	-	-
Fathead/ 43.9 %	24.9 (24.5-25.2)	24.4 (24.2-24.6)	8.0 (7.6-8.2)	7.5 (6.6-7.9)	8.03 (7.95-8.08)	7.81 (7.58-7.94)	264 (260-271)	-	-	-
Fathead/ 72 %	25.0 (24.4-25.4)	24.6 (24.2-25.5)	8.0 (7.6-8.4)	7.4 (6.7-7.9)	7.99 (7.91-8.04)	7.77 (7.55-7.91)	222 (219-225)	-	-	-
Fathead/ 100 %	25.1 (24.8-25.4)	24.4 (24.2-24.6)	8.1 (7.6-8.4)	7.5 (7.1-7.8)	7.93 (7.85-7.99)	7.76 (7.54-7.88)	180 (177-185)	55 (54-56)	69 (66-70)	<0.10 (<0.10-<0.10)
Fathead/ Intake	25.0 (24.7-25.3)	24.4 (24.2-24.6)	8.1 (7.8-8.5)	7.6 (7.2-7.9)	7.92 (7.82-7.98)	7.75 (7.52-7.90)	177 (174-182)	56 (54-59)	70 (66-76)	<0.10 (<0.10-<0.10)

Sequoyah Nuclear Plant Biomonitoring
February 26 – March 05, 2002

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

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: WANDA ALLEN

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	1454 2/24/02 1578	~~1354~~ 2/25/01 1418	2 (2.5g)				✓		269 020226.01	0.0°C	REL	1105	CUSTODY SEALS INTACT SAMPLES RECEIVED IN GOOD CONDITION
SQN-INT-TOX	comp	4	2/24/02 1539	2/25/02 1439	1 (2.5g)				✓		269 020226.02	0.6°C	REL	1105	

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	2/25/02 1500	Fed Ex	2/25/02 1500
Fed-ex	02-26-02 1105	K Kleman ETS	02-26-02 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.

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: WANDA ALLEN

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	1026 2/26/02	2/27/02 0926	2 (2.5g)				✓		269 020228.01	0.2°C	JL	1045	CUSTODY SEALS INTACT & SAMPLES RECEIVED IN GOOD CONDITION
SQN-INT-TOX	comp	4	2/26/02 1038	2/27/02 0938	1 (2.5g)				✓		269 020228.02	0.7°C	JL	1045	

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	2/27/02 1200	Fed Ex	2/27/02 1600
FedEx	02-28-02 1045	J Sumner	02-28-02 1045

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: WANDA ALLEN

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	1535 ~~2/29/02~~ 02-28-02	3/1/02 1235	2 (2.5g)				✓		269 020302.01	0.6°C	JS	1058	CUSTODY SEALS INTACT
SQN-INT-TOX	comp	4	1405 ~~2/29/02~~ 02-28-02	3/1/02 1305	1 (2.5g)				✓		269 020302.02	1.1°C	JS	1058	SAMPLES RECEIVED IN GOOD CONDITION

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen	3/1/02 1500	Fed Ex #5	3/1/02 1500
FedEx	03-02-02 1058	J Lumner	03-02-02 1058

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.

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
02-14-02	0946	Jumper	D.TRAMMEL	2.1°C	262	020214.01	TEST AMERICA EARTH ENV. - MARSHALL WWTP	NC	
02-14-02	1130	KEKeenAN	FeDex	1.0°C	263	020214.02	GEORGETOWN STEEL - DRI PLANT	SC	
02-15-02	1120	KEKeenAN	FeDex	0.5°C	260	020215.01	TVA KINGSTON INTAKE	TN	
02-15-02	1120	KEKeenAN	FeDex	0.5°C	260	020215.02	TVA KINGSTON OUTFALL 002	TN	
02-15-02	1317	Jumper	R. Vess	1.2°C	261	020215.03	BAXTER HEALTHCARE CORP.	NC	
02-15-02	1322	Jumper	R. PATE	1.9°C	264	020215.04	EMS - THE MOUNTAIN WWTP	NC	
02-16-02	1114	KEKeenAN	FeDex	0.8°C	259	020216.01	ENFIELD WWTP	NC	
02-16-02	1114	KEKeenAN	GREYHOUND	2.0°C	254	020216.02	PRECISE ANALYTICAL - FIELDCREST MILLS	NC	
02-16-02	1115	KEKeenAN	ASHEVILLE COURIER	0.7°C	255	020216.03	COMM SCOPE, INC.	NC	
02-16-02	1115	KEKeenAN	D.TRAMMEL	0.4°C	256	020216.04	TEST AMERICA EARTH ENV. - ANDREWS WWTP	NC	
02-17-02	1032	KEKeenAN	D.THOMAS	2.3°C	260	020217.01	TVA KINGSTON INTAKE	TN	
02-17-02	1032	KEKeenAN	D.THOMAS	2.3°C	260	020217.02	TVA KINGSTON OUTFALL 002	TN	
02-19-02	1106	Jumper	FeDex	0.8°C	265	020219.01	DUKE ENERGY - McGUIRE 002	NC	
02-20-02	1038	Jumper	FeDex	1.1°C	266	020220.01 ~~020219~~	DUKE ENERGY - McGUIRE 001	NC	
02-20-02	1038	Jumper	FeDex	1.7°C	267	020220.02	DUKE ENERGY - BELEWS CREEK	NC	
02-20-02	1038	Jumper	FeDex	0.9°C	268	020220.03	DUKE ENERGY - MARSHALL	NC	
02-23-02	1122	Jumper	FeDex	1.0°C	267	020223.01 ~~020220.02~~	DUKE ENERGY - BELEWS CREEK	NC	
02-23-02	1122	Jumper	FeDex	1.3°C	268	020223.02	DUKE ENERGY - MARSHALL	NC	
02-26-02	1105	KEKeenAN	FeDex	0.9°C	269	020226.01	TVA SEQUOYAH NUCLEAR PLANT OUTFALL 101	TN	
02-26-02	1105	KEKeenAN	FeDex	0.6°C	269	020226.02	TVA SEQUOYAH NUCLEAR PLANT INTAKE	TN	
02-28-02	1045	Jumper	FeDex	0.2°C	269	020228.01	TVA SEQUOYAH NUCLEAR PLANT OUTFALL 101	TN	

Sample Receipt Log

Date Received	Time Received	Received By	Received From	Sample Temperature (°C)	Project Number	Sample Number	Sample Name and Description	State	Comments
02-28-02	1045	Jlumar	Fedex	0.7°C	269	020228.02	TVA Sequoyah Nuclear Plant Intake	TN	
03-02-02	1058	Jlumar	Fedex	0.6°C	269	020302.01	TVA Sequoyah Nuclear Plant Outfall 101	TN	
03-02-02	1058	Jlumar	Fedex	1.1°C	269	020302.02	TVA Sequoyah Nuclear Plant Intake	TN	
03-05-02	1138	Jlumar	UPS	NA	270	020305.01	Neo Solutions - Westwood Chemical Corp Aluminum Chloride Soln.	NY	Product Test.
03-05-02	1506	Jlumar	K. White	2.1°C	271	020305.02	Goldie & Associates Christ School WWTP	NC	
03-06-02	1040	KEKeenan	Fedex	2.1°C	272	020306.01	Georgetown Steel - Scale Pit	SC	
03-06-02	1041	KEKeenan	Fedex	0.7°C	273	020306.02	Duke Energy - Buck Steam Station	NC	
03-06-02	1041	KEKeenan	Fedex	1.0°C	274	020306.03	Duke Energy - Cliffside Steam Station	NC	
03-06-02	1042	KEKeenan	Fedex	0.6°C	275	020306.04	Craven County Wood Energy	NC	
03-06-02	1043	KEKeenan	Fedex	0.8°C	276	020306.05	PCS Phosphate Outfall 007	NC	
03-06-02	1043	KEKeenan	Fedex	0.4°C	276	020306.06	PCS Phosphate Outfall 100	NC	
03-06-02	1044	KEKeenan	Fedex	0.4°C	277	020306.07	Greenville Utilities Commission	NC	
03-06-02	1044	KEKeenan	Fedex	0.4°C	278	020306.08	Monroe WWTP	NC	
03-07-02	1013	KEKeenan	UPS	0.5°C	279	020307.01	Tritest, Inc. CP&L - Roxboro Plant	NC	

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

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

Dilution preparation information:						*Comments:*
MHS batch:		02-18-02	02-26-02			
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	131.76	264	526.8	864	1200	
Diluent volume (mL)	1068.24	936	673.2	336	0	

Test organism information: Cre 04-03-02		*Test information:*	
Organism age:	23 24-HOURS OLD	Randomizing template:	GREEN
Date and times organisms were born between:	02-25-02 1530 TO 1500 MST 1530 to 1700 EST	Incubator number:	2
Organism source:	ABS BATCH 02-25-02	*Artemia* lot number:	86 0207P
Transfer bowl information:	pH = 7.93 Temperature = 24.2°C	Oven temperature:	60°C
		Drying time:	24-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	02-26-02	—	1440	1438	[illegible]
1	02-27-02	0851	1450	1431	[illegible]
2	02-28-02	0847	1450	1421	[illegible]
3	03-01-02	0850	1450	1426	[illegible]
4	03-02-02	1100	1700	1422	KEK
5	03-04-02 (03) Cre 04-03-02	0937	1540	1433	[illegible] KEK
6	03-05-02 (04) Cre 04-03-02	0850	1450	1416	[illegible]
7	03-06-02 (05) Cre 04-03-02	—	[illegible]	1430	[illegible]

Control information:		Acceptance criteria
% Mortality:	0%	≤ 20%
Average weight per larvae:	0.6151	≥ 0.25 mg/larvae

Summary of test endpoints:	
7-day LC50	>100%
NOEC	100%
LOEC	>100%
ChV	>100%
IC25	>100%

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH NONTREATED

Date: 02-26-02

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	10	10	10	10	1 Killed 9	10	10	10	10
5	10	10	10	10	9 1d	10	10	8 1d	10	10	10	10
6	10	10	10	10	9	10	10	7 1d	10	10	10	10
7	10	10	10	10	9	10	10	5 2d	10	10	10	10
A = Pan weight (mg)	15.038	14.940	14.970	15.070	14.708	14.848	14.785	14.681	15.085	14.646	14.657	14.627
B = Pan + Larvae weight (mg)	22.06	21.40	21.15	20.01	20.26	20.82	20.82	17.65	20.88	20.16	19.88	19.98
Larvae weight (mg) = A – B	7.022	6.460	6.180	4.940	5.552	5.972	6.105	2.969	5.795	5.514	5.223	5.353

Calculations and data reviewed: JF

Comments: * Bacteria growth observed on minnows before death.

Species: ***Pimephales promelas***

Client: TVA-SEQUOYAH
NONTREATED

Date: 02-26-02

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	8rd
6	10	10	10	10	10	10	10	10	10	10	10	8
7	10	10	10	10	9rd	10	10	10	10	10	10	7rd
A = Pan weight (mg)	14.727	14.621	14.847	14.834	14.936	~~14.929~~ 14.814	14.800	15.039	14.851	14.981	15.051	14.642
B = Pan + Larvae weight (mg)	20.44	19.92	21.11	20.26	20.73	21.00	21.73	20.64	21.70	21.24	21.57	18.51
Larvae weight (mg) = A – B	5.713	5.299	6.263	5.426	5.794	6.186	6.930	5.601	6.849	6.259	6.519	3.868

Calculations and data reviewed: [illegible]

Comments: * Bacteria growth observed on minnows before death.

Species: ***Pimephales promelas***

Client: TVA SEQUOYAH NONTREATED

Date: 02-26-02

Survival and Growth Data

Day	100% INTAKE											
	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
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)	14.85	14.983	14.945	14.910								
B = Pan + Larvae weight (mg)	20.46	21.80	20.19	20.82								
Larvae weight (mg) = A – B	5.345	6.817	5.245	5.910								

Calculations and data reviewed: JF

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: February 26 - March 5, 2002

Project number: 269

Reveiwed by: Jensen

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	15.038	22.060	7.022	0.7022	100.0	0.6151	14.3	Not applicable
	B	10	10	14.940	21.400	6.460	0.6460				
	C	10	10	14.970	21.150	6.180	0.6180				
	D	10	10	15.070	20.010	4.940	0.4940				
10.98%	E	10	9	14.708	20.260	5.552	0.5552	86.4	0.5232	25.0	14.9
	F	10	10	14.848	20.820	5.972	0.5972				
	G	10	10	14.715	20.820	6.105	0.6105				
	H	9	5	14.681	17.650	2.969	0.3299				
22%	I	10	10	15.085	20.880	5.795	0.5795	100.0	0.5471	4.5	11.0
	J	10	10	14.646	20.160	5.514	0.5514				
	K	10	10	14.657	19.880	5.223	0.5223				
	L	10	10	14.627	19.980	5.353	0.5353				
43.9%	M	10	10	14.727	20.440	5.713	0.5713	100.0	0.5675	7.5	7.7
	N	10	10	14.621	19.920	5.299	0.5299				
	O	10	10	14.847	21.110	6.263	0.6263				
	P	10	10	14.834	20.260	5.426	0.5426				
72%	Q	10	9	14.936	20.730	5.794	0.5794	97.5	0.6128	9.6	0.4
	R	10	10	14.814	21.000	6.186	0.6186				
	S	10	10	14.800	21.730	6.930	0.6930				
	T	10	10	15.039	20.640	5.601	0.5601				
100%	U	10	10	14.851	21.700	6.849	0.6849	92.5	0.5874	23.1	4.5
	V	10	10	14.981	21.240	6.259	0.6259				
	W	10	10	15.051	21.570	6.519	0.6519				
	X	10	7	14.642	18.510	3.868	0.3868				
100% Intake	Y	10	10	15.095	20.460	5.365	0.5365	100.0	0.5834	12.3	5.1
	Z	10	10	14.983	21.800	6.817	0.6817				
	AA	10	10	14.945	20.190	5.245	0.5245				
	BB	10	10	14.910	20.820	5.910	0.5910				

Outfall 101:
Dunnett's MSD value: 0.1544
PMSD: 25.1

Intake:
Dunnett's MSD value: 0.1102
PMSD: 17.9

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 19.5% from the control (determined
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 Survival

Start Date:	2/26/02	Test ID:	PpFRCR	Sample ID:	TVA SQN, Outfall 101 - Nontreated
End Date:	3/5/02	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:					

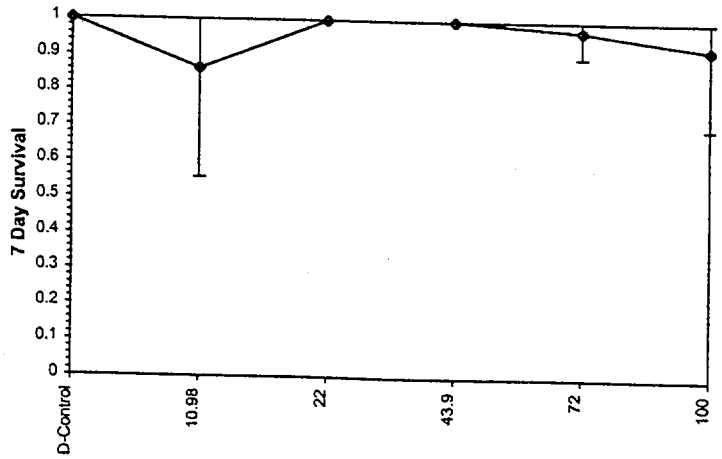
Conc-%	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
10.98	0.9000	1.0000	1.0000	0.5556
22	1.0000	1.0000	1.0000	1.0000
43.9	1.0000	1.0000	1.0000	1.0000
72	0.9000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	0.7000

			Transform: Arcsin Square Root					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4		
10.98	0.8639	0.8639	1.2285	0.8411	1.4120	21.936	4	14.00	10.00
22	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
43.9	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00
72	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00
100	0.9250	0.9250	1.3068	0.9912	1.4120	16.103	4	16.00	10.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.75127089	0.884	-1.747871287	4.247234099
Equality of variance cannot be confirmed				

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

Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/26/02	Test ID:	PpFRCR	Sample ID:	TVA SQN, Outfall 101 - Nontreated
End Date:	3/5/02	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	0.7022	0.6460	0.6180	0.4940
10.98	0.5552	0.5972	0.6105	0.3299
22	0.5795	0.5514	0.5223	0.5353
43.9	0.5713	0.5299	0.6263	0.5426
72	0.5794	0.6186	0.6930	0.5601
100	0.6849	0.6259	0.6519	0.3868

Conc-%	Mean	N-Mean	Transform: Untransformed Mean	Min	Max	CV%	N	Rank Sum	1-Tailed Critical	Isotonic Mean	N-Mean
D-Control	0.6151	1.0000	0.6151	0.4940	0.7022	14.302	4			0.6151	1.0000
10.98	0.5232	0.8507	0.5232	0.3299	0.6105	25.040	4	13.00	10.00	0.5676	0.9229
22	0.5471	0.8896	0.5471	0.5223	0.5795	4.505	4	14.00	10.00	0.5676	0.9229
43.9	0.5675	0.9227	0.5675	0.5299	0.6263	7.548	4	15.00	10.00	0.5676	0.9229
72	0.6128	0.9963	0.6128	0.5601	0.6930	9.589	4	17.00	10.00	0.5676	0.9229
100	0.5874	0.9550	0.5874	0.3868	0.6849	23.133	4	18.00	10.00	0.5676	0.9229

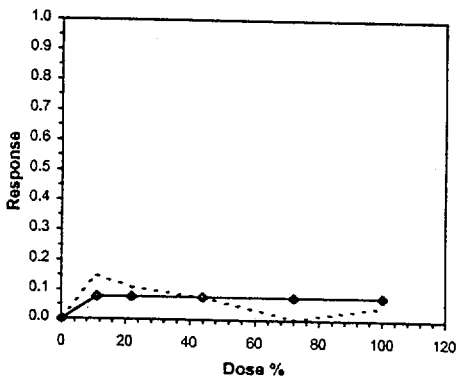
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.87742573	0.884	-1.24633217	1.425134333
Bartlett's Test indicates equal variances (p = 0.10)	9.240524292	15.08631706		

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

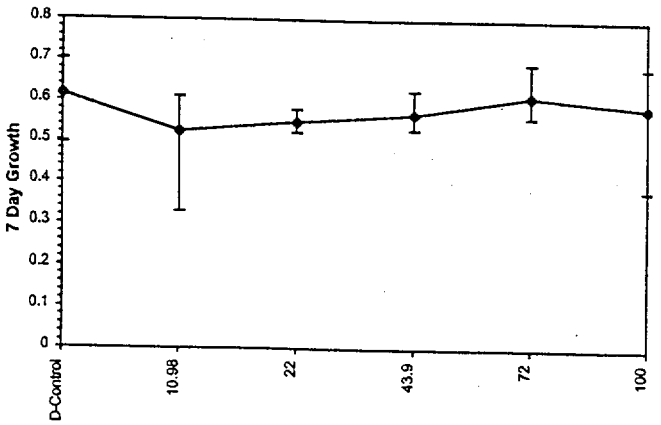
Linear Interpolation (80 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	7.1161			
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

Used for PMSD calculation only.

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/26/02	Test ID:	PpFRCR	Sample ID:	TVA SQN, Outfall 101 - Nontreated
End Date:	3/5/02	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	0.7022	0.6460	0.6180	0.4940
10.98	0.5552	0.5972	0.6105	0.3299
22	0.5795	0.5514	0.5223	0.5353
43.9	0.5713	0.5299	0.6263	0.5426
72	0.5794	0.6186	0.6930	0.5601
100	0.6849	0.6259	0.6519	0.3868

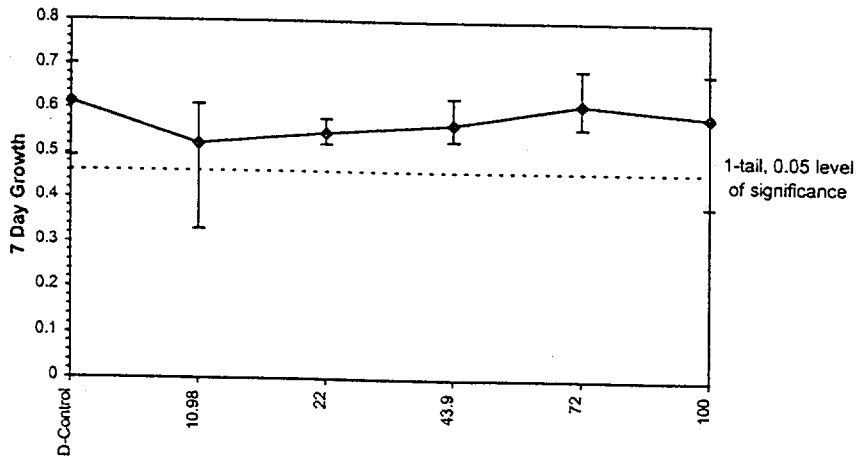
			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.6151	1.0000	0.6151	0.4940	0.7022	14.302	4			
10.98	0.5232	0.8507	0.5232	0.3299	0.6105	25.040	4	1.434	2.410	0.1544
22	0.5471	0.8896	0.5471	0.5223	0.5795	4.505	4	1.060	2.410	0.1544
43.9	0.5675	0.9227	0.5675	0.5299	0.6263	7.548	4	0.742	2.410	0.1544
72	0.6128	0.9963	0.6128	0.5601	0.6930	9.589	4	0.036	2.410	0.1544
100	0.5874	0.9550	0.5874	0.3868	0.6849	23.133	4	0.432	2.410	0.1544

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.87742573	0.884	-1.24633217	1.425134333
Bartlett's Test indicates equal variances (p = 0.10)	9.240524292	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	0.154409948	0.251052676	0.005359172	0.008210062	0.663285613	5, 18

Dose-Response Plot



Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/26/02	Test ID:	PpFRCR	Sample ID:	TVA SQN, Intake - Nontreated
End Date:	3/5/02	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	0.7022	0.6460	0.6180	0.4940
100	0.5365	0.6817	0.5245	0.5910

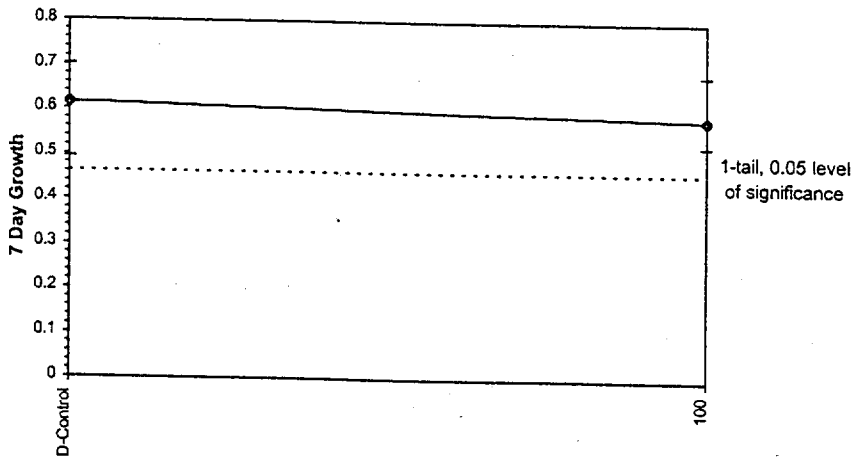
			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.6151	1.0000	0.6151	0.4940	0.7022	14.302	4			
100	0.5834	0.9486	0.5834	0.5245	0.6817	12.276	4	0.558	1.943	0.1102

Auxillary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.962760925	0.749	-0.204880953	-0.576806113
F-Test indicates equal variances (p = 0.74)	1.508488178	47.46834564		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Dose-Response Plot



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

	Date	Time	Analyst
Test start	02-26-02	1522	JJ
Test end	03-05-02	1520	JJ

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

Dilution preparation information:						*Comments:*
MHS batch:		02-18-02 / 02-26-02				
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	131.76	264	526.8	864	1200	
Diluent volume (mL)	1068.24	936	673.2	336	0	

Test organism information:		*Test information:*	
Organism age:	<24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	02-26-02 0810 TO 1236	Incubator number:	2
Organism source:	02-19-02 A+B	YCT batch: A&B	01-23-02
Transfer bowl information:	pH = 8.11 Temperature = 24.4	*Selenastrum* batch: ABS	02-22-02

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	3	0	0	4	4	0	0	0	0	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	3	5	0	0	4	5	3	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	7	8	7	6	8	6	8	6	6	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	4	0	11	12	0	0	0	0	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	12	10	14	2	0	12	13	12	10	0
Total young produced		22	25	26	23	24	22	26	21	20	25
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: JJ

Test Renewal, Feeding, and Incubator Location Information

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	03-04	02-26	02-27	02-28	03-01	03-02	03-03
Time	1456	1522	1514	1516	1500	1506	1453
Analyst	JJ	JJ	JJ	JJ	JJ	JJ	JJ
Shelf Location	B1	B1	B1	B1	B1	B1	B1

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	100%
% Mortality:	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	23.4	≥ 15.0 offspring/female	ChV	>100%
% CV:	9.1%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*

Client: TVA SEQUOYAH NONTREATED **Date:** 02-26-02

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	0	3	0	0	0	0	0	0	0	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	0	4	5	3	4	4	5	5	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	7	6	6	8	7	6	6	9	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	10	12	0	0	0	13	0	12	0	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	13	12	12	0	12	0	14	0
Total young produced		21	22	23	23	23	24	22	23	28	24
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	23.3
% Reduction from Control:	0.4%

Calculations and data reviewed: JL

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	3	0	3	0	0	0	0	0	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	4	0	4	3	4	5	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	8	8	9	8	6	8	6	8	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	13	12	11	0	12	13	0	0	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	13	0	0	0	12	0	0	14	12	0
Total young produced		26	24	24	23	24	21	25	25	23	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	24.2
% Reduction from Control:	-3.4%

Calculations and data reviewed: JL

Species: *Ceriodaphnia dubia*

Client: TVA SEQUOYAH NONTREATED **Date:** 02-26-02

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	0	0	0	0	4	0	0	0	0	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	3	4	3	0	4	4	3	3	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	8	8	9	9	6	8	6	10	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	15	12	14	0	16	0	12	13	15	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	14	0	12	0	0	0	0
Total young produced		28	23	26	26	29	22	24	22	28	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	25.5
% Reduction from Control:	-9.6%

Calculations and data reviewed: [illegible]

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	4	3	4	3	4	3	0	5	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	0	0	0	4	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	10	7	9	9	10	8	11	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	16	16	17	14	14	16	0	15	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	0	0	15	0	0
Total young produced		26	30	26	30	26	28	27	30	31	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

1

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.2
% Reduction from Control:	-20.5%

Calculations and data reviewed: [illegible]

Species: *Ceriodaphnia dubia*

Client: TVA SEQUOYAH NONTREATED **Date:** 02-26-02

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	4	4	0	3	5	4	4	3	0	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	4	0	0	0	0	1	4	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	10	8	10	11	12	10	10	10	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	18	15	16	12	15	16	15	13	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	0	0	0	0	0
Total young produced		31	32	27	29	28	31	30	29	27	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

1

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.2
% Reduction from Control:	-24.8%

Calculations and data reviewed: JH

CONCENTRATION: 100% INTAKE

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	4	5	3	4	0	4	4	3	0	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	0	0	0	0	4	0	0	0	5	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	8	10	9	10	12	12	8	10	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	14	15	14	16	13	15	12	16	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	0	0	0	0	0	0	0	0	0
Total young produced		26	27	28	27	30	29	31	23	31	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.2
% Reduction from Control:	-20.5%

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

lient: TVA Sequoyah Nuclear Plant, Nontreated

est dates: February 26 - March 5, 2002

·oject number: 269

Reveiwed by:

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	22	25	26	23	24	22	26	21	20	25	100	23.4	9.1	Not applicable
10.98%	21	22	23	23	23	24	22	23	28	24	100	23.3	8.1	0.4
22%	26	24	24	23	24	21	25	25	23	27	100	24.2	7.0	-3.4
43.9%	28	23	26	26	29	22	24	22	28	27	100	25.5	10.2	-9.0
72%	26	30	26	30	26	28	27	30	31	28	100	28.2	6.9	-20.5
100%	31	32	27	29	28	31	30	29	27	28	100	29.2	6.0	-24.8
100% Intake	26	27	28	27	30	29	31	23	31	30	100	28.2	9.0	-20.5

utfall 101:

innett's MSD value: 2.063

ISD: 8.8

ake:

nnett's MSD value: 1.809

ISD: 7.7

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 13.0% from the control.

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

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

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

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:	2/26/02	Test ID:	CdFRCR	Sample ID:	TVA SQN, Outfall 101 - Nontreated
End Date:	3/5/02	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	22.000	25.000	26.000	23.000	24.000	22.000	26.000	21.000	20.000	25.000
10.98	21.000	22.000	23.000	23.000	23.000	24.000	22.000	23.000	28.000	24.000
22	26.000	24.000	24.000	23.000	24.000	21.000	25.000	25.000	23.000	27.000
43.9	28.000	23.000	26.000	26.000	29.000	22.000	24.000	22.000	28.000	27.000
72	26.000	30.000	26.000	30.000	26.000	28.000	27.000	30.000	31.000	28.000
100	31.000	32.000	27.000	29.000	28.000	31.000	30.000	29.000	27.000	28.000

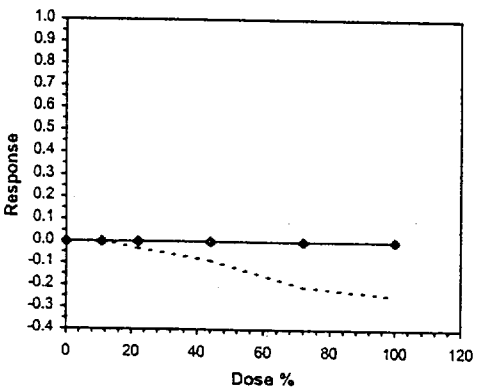
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	23.400	1.0000	23.400	20.000	26.000	9.054	10				25.633	1.0000
10.98	23.300	0.9957	23.300	21.000	28.000	8.105	10	0.111	2.287	2.063	25.633	1.0000
22	24.200	1.0342	24.200	21.000	27.000	6.969	10	-0.887	2.287	2.063	25.633	1.0000
43.9	25.500	1.0897	25.500	22.000	29.000	10.168	10	-2.327	2.287	2.063	25.633	1.0000
72	28.200	1.2051	28.200	26.000	31.000	6.852	10	-5.320	2.287	2.063	25.633	1.0000
100	29.200	1.2479	29.200	27.000	32.000	5.997	10	-6.428	2.287	2.063	25.633	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.84679538	1.035	0.130211394	-0.644187356
Bartlett's Test indicates equal variances (p = 0.81)	2.247287512	15.08631706		

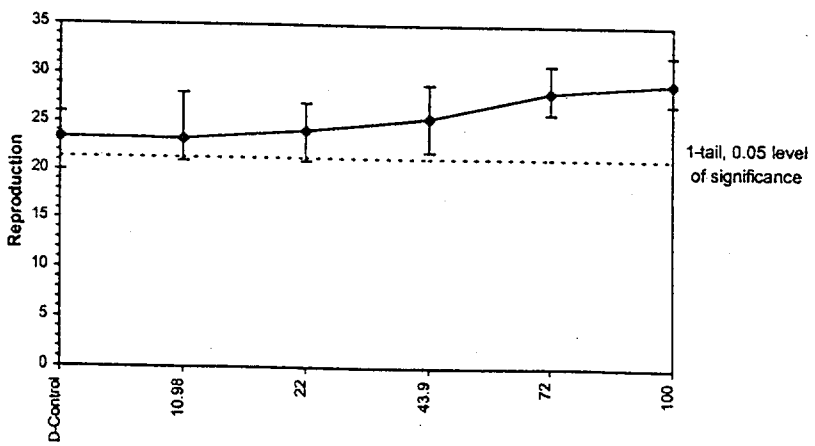
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.06316906	0.088169618	63.62666667	4.07037037	1.7E-09	5, 54

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

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	2/26/02	Test ID:	CdFRCR	Sample ID:	TVA SQN, Intake - Nontreated
End Date:	3/5/02	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	22.000	25.000	26.000	23.000	24.000	22.000	26.000	21.000	20.000	25.000
100	26.000	27.000	28.000	27.000	30.000	29.000	31.000	23.000	31.000	30.000

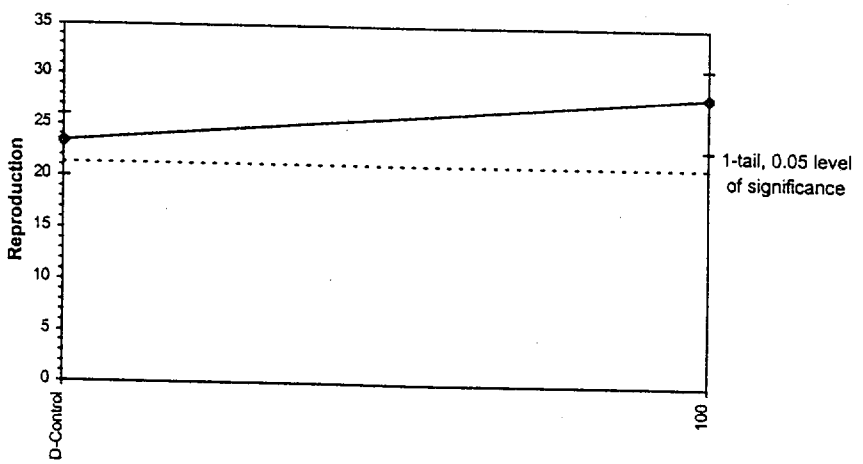
			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	23.400	1.0000	23.400	20.000	26.000	9.054	10			
100	28.200	1.2051	28.200	23.000	31.000	8.971	10	-4.600	1.734	1.809

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.934985161	0.868	-0.567916859	-0.329037901
F-Test indicates equal variances (p = 0.61)	1.425742626	6.54108572		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Dose-Response Plot



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

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

Dilution preparation information:						*Comments:*
MHS batch:		02-18-02 / 02-26-02				Each dilution was UV-treated for 2 minutes in a 40-WATT lifeguard UV-sterilizer
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	131.76	264	526.8	864	1200	
Diluent volume (mL)	1068.24	936	673.2	336	0	

Test organism information: Cyr 04-03-02		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	02-25-02 1330 TO 1500 MST 1530 to 1700 EST	Incubator number:	2
Organism source:	ABS BATCH 02-25-02	*Artemia* lot number:	BG0207P
Transfer bowl information:	pH = 7.93 Temperature = 24.2°C	Oven temperature:	60°C
		Drying time:	24-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	02-26-02	——	1440	1438	JI
1	02-27-02	0851	1450	1417	JI
2	02-28-02	0847	1450	1406	JI
3	03-01-02	0850	1450	1403	JI
4	03-02-02	1100	1700	1400	KEK
5	03.03.02	0937	1540	1411	KEK
6	03-04-02	0850	1450	1357	JI
7	03-05-02	——	——	1430	JI

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC50	> 100%
Average weight per larvae:	0.4764	≥ 0.25 mg/larvae	NOEC	100%
			LOEC	> 100%
			ChV	> 100%
			IC25	> 100%

Species: ***Pimephales promelas***

Client: TVA-SEQUOYAH
UV TREATED

Date: 02-26-02

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	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	9 id
6	10	10	10	10	10	10	10	10	10	10	10	9
7	10	10	10	10	10	10	10	10	10	10	10	9
A = Pan weight (mg)	14.787	14.820	14.645	14.993	14.696	15.007	15.048	14.941	14.657	14.687	14.682	14.917
B = Pan + Larvae weight (mg)	20.04	19.58	19.36	19.32	19.63	20.21	20.64	20.68	19.53	19.24	19.54	21.13
Larvae weight (mg) = A – B	5.253	4.760	4.715	4.327	4.934	5.203	5.592	5.839	4.873	4.553	4.858	6.23

Calculations and data reviewed: JL

Comments:

Species: ***Pimephales promelas***

Client: TVA - SEQUOYAH
UV-TREATED

Date: 02-26-02

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)	15.057	14.754	14.886	14.977	14.714	14.662	14.866	14.806	15.016	15.031	15.010	14.949
B = Pan + Larvae weight (mg)	~~21.[illegible]~~ 22.22	~~22.[illegible]~~ 19.68	19.99	20.40	20.82	20.45	19.52	19.84	20.03	20.14	20.17	20.90
Larvae weight (mg) = A – B	7.163	4.926	5.104	5.423	6.106	5.788	4.654	5.032	5.014	5.109	5.160	5.951

Calculations and data reviewed: [illegible]

Comments:

Species: ***Pimephales promelas***

Client: TVA - SEQUOYAH
UV-TREATED

Date: 02-26-02

Survival and Growth Data

Day	100% INTAKE											
	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
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)	15.274	14.895	15.025	14.654								
B = Pan + Larvae weight (mg)	20.85	20.76	20.43	19.87								
Larvae weight (mg) = A – B	5.579	5.865	5.405	5.216								

Calculations and data reviewed: JH

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: February 26 - March 5, 2002

Project number: 269

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	14.787	20.040	5.253	0.5253	100.0	0.4764	8.0	Not applicable
	B	10	10	14.820	19.580	4.760	0.4760				
	C	10	10	14.645	19.360	4.715	0.4715				
	D	10	10	14.993	19.320	4.327	0.4327				
10.98%	E	10	10	14.696	19.630	4.934	0.4934	100.0	0.5392	7.5	-13.2
	F	10	10	15.007	20.210	5.203	0.5203				
	G	10	10	15.048	20.640	5.592	0.5592				
	H	10	10	14.841	20.680	5.839	0.5839				
22%	I	10	10	14.657	19.530	4.873	0.4873	97.5	0.5124	14.5	-7.6
	J	10	10	14.687	19.240	4.553	0.4553				
	K	10	10	14.682	19.540	4.858	0.4858				
	L	10	9	14.917	21.130	6.213	0.6213				
43.9%	M	10	10	15.057	22.220	7.163	0.7163	100.0	0.5654	18.2	-18.7
	N	10	10	14.754	19.680	4.926	0.4926				
	O	10	10	14.886	19.990	5.104	0.5104				
	P	10	10	14.977	20.400	5.423	0.5423				
72%	Q	10	10	14.714	20.820	6.106	0.6106	100.0	0.5395	12.4	-13.3
	R	10	10	14.662	20.450	5.788	0.5788				
	S	10	10	14.866	19.520	4.654	0.4654				
	T	10	10	14.808	19.840	5.032	0.5032				
100%	U	10	10	15.016	20.030	5.014	0.5014	100.0	0.5309	8.1	-11.4
	V	10	10	15.031	20.140	5.109	0.5109				
	W	10	10	15.010	20.170	5.160	0.5160				
	X	10	10	14.949	20.900	5.951	0.5951				
100% Intake	Y	10	10	15.271	20.850	5.579	0.5579	100.0	0.5516	5.0	-15.8
	Z	10	10	14.895	20.760	5.865	0.5865				
	AA	10	10	15.025	20.430	5.405	0.5405				
	BB	10	10	14.654	19.870	5.216	0.5216				

Outfall 101:

Dunnett's MSD value: 0.1109

PMSD: 23.3

Intake:

Dunnett's MSD value: 0.0456

PMSD: 9.6

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Pimephales growth by 19.5% 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:	2/26/02	Test ID:	PpFRCR	Sample ID:	TVA SQN, Outfall 101 - UV Treated
End Date:	3/5/02	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	0.5253	0.4760	0.4715	0.4327
10.98	0.4934	0.5203	0.5592	0.5839
22	0.4873	0.4553	0.4858	0.6213
43.9	0.7163	0.4926	0.5104	0.5423
72	0.6106	0.5788	0.4654	0.5032
100	0.5014	0.5109	0.5160	0.5951

Conc-%	Mean	N-Mean	Transform: Untransformed Mean	Min	Max	CV%	N	t-Stat	1-Tailed Critical	MSD	Isotonic Mean	N-Mean
D-Control	0.4764	1.0000	0.4764	0.4327	0.5253	7.971	4				0.5273	1.0000
10.98	0.5392	1.1319	0.5392	0.4934	0.5839	7.459	4	-1.365	2.410	0.1109	0.5273	1.0000
22	0.5124	1.0757	0.5124	0.4553	0.6213	14.454	4	-0.783	2.410	0.1109	0.5273	1.0000
43.9	0.5654	1.1869	0.5654	0.4926	0.7163	18.161	4	-1.934	2.410	0.1109	0.5273	1.0000
72	0.5395	1.1325	0.5395	0.4654	0.6106	12.392	4	-1.371	2.410	0.1109	0.5273	1.0000
100	0.5309	1.1144	0.5309	0.5014	0.5951	8.149	4	-1.183	2.410	0.1109	0.5273	1.0000

Auxiliary Tests

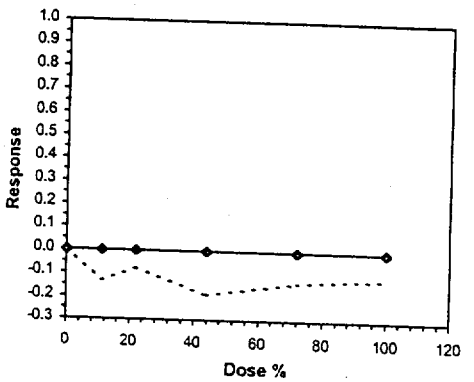
	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.912900209	0.884	1.033702897	0.691427456
Bartlett's Test indicates equal variances (p = 0.50)	4.345994949	15.08631706		

Hypothesis Test (1-tail, 0.05)

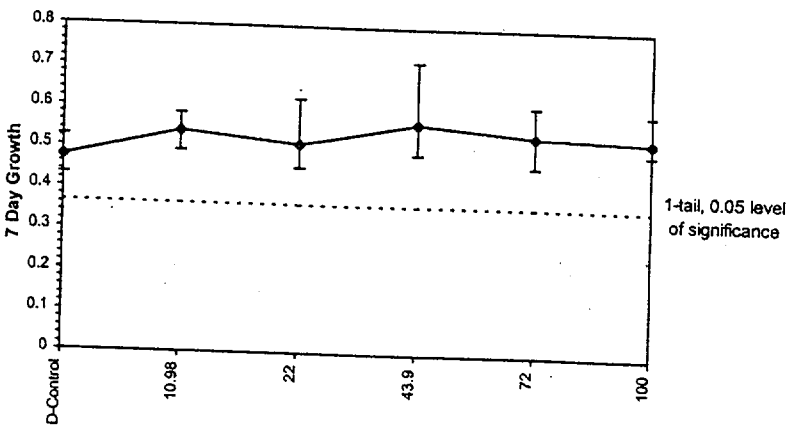
	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.110940414	0.232884626	0.003655427	0.004238141	0.524823785	5, 18

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:	2/26/02	Test ID:	PpFRCR	Sample ID:	TVA SQN, Intake - UV Treated
End Date:	3/5/02	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	0.5253	0.4760	0.4715	0.4327
100	0.5579	0.5865	0.5405	0.5216

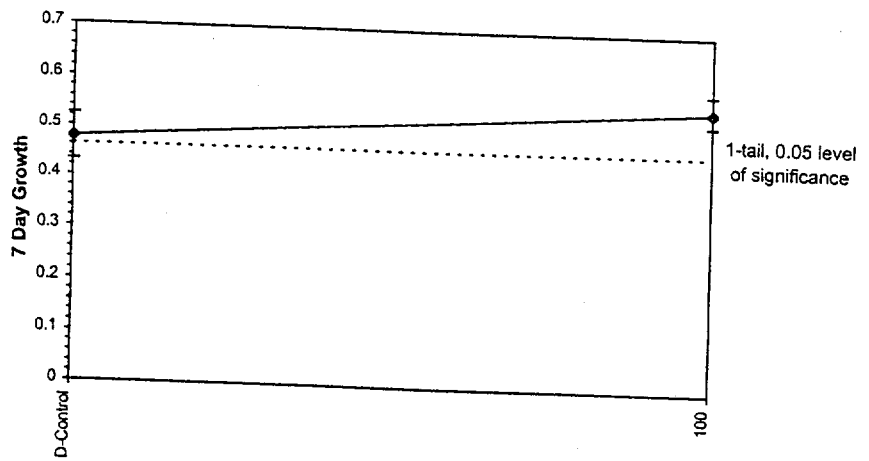
			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.4764	1.0000	0.4764	0.4327	0.5253	7.971	4			
100	0.5516	1.1580	0.5516	0.5216	0.5865	4.999	4	-3.207	1.943	0.0456

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.965459824	0.749	0.314736868	-0.404384508
F-Test indicates equal variances (p = 0.61)	1.89620471	47.46834564		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Dose-Response Plot



Species: *Ceriodaphnia dubia* and *Pimephales promelas*

Environmental Testing Solutions, LLC

Summary of Chemical Analyses

Client: Sequoyah Nuclear Plant Non-Treated

Test dates: February 26-March 05, 2002

Project number: 269

Reviewed by: [signature]

Concentration	Parameter	Initial				*Pimephales promelas* Final				*Ceriodaphnia dubia* Final			
		Minimum	Maximum	Mean	*S*	Minimum	Maximum	Mean	*S*	Minimum	Maximum	Mean	*S*
Control	pH (SU)	8.08	8.11	8.10	0.01	7.65	8.02	7.86	0.15	8.07	8.17	8.12	0.04
	DO (mg/L)	7.6	8.2	8.0	0.2	7.0	7.8	7.4	0.3	8.0	8.2	8.1	0.1
	Conductivity (µmhos/cm)	309	323	315	5								
	Alkalinity (mg/L $CaCO_3$)	65	69	67	3								
	Hardness (mg/L $CaCO_3$)	86	86	86	0								
	Initial Temperature (°C)					24.3	25.0	24.6	0.3	24.3	24.7	24.5	0.2
	Final Temperature (°C)					24.2	24.7	24.4	0.2	24.2	24.6	24.4	0.1
10.98%	pH (SU)	8.08	8.12	8.10	0.01	7.52	8.0 ~~8.11~~	7.81	0.20	8.07	8.18	8.13	0.04
	DO (mg/L)	7.8	8.1	8.0	0.1	6.5	7.9	7.4	0.5	8.0	8.2	8.1	0.1
	Conductivity (µmhos/cm)	302	322	308	7								
	Initial Temperature (°C)					24.4	25.0	24.7	0.2	24.5	24.9	24.6	0.2
	Final Temperature (°C)					24.2	24.7	24.4	0.2	24.2	24.6	24.4	0.1
22%	pH (SU)	8.06	8.12	8.09	0.02	7.50	8.00	7.80	0.20	8.07	8.14 ~~8.19~~	8.13 ~~8.12~~	0.04
	DO (mg/L)	7.9	8.2	8.0	0.1	6.4	7.9 ~~8.2~~	7.4	0.5	8.0	8.2	8.1	0.1
	Conductivity (µmhos/cm)	289	307	295	6								
	Initial Temperature (°C)					24.4	24.9	24.7	0.2	24.4	24.9	24.6	0.2
	Final Temperature (°C)					24.2	24.7	24.4	0.2	24.2	24.6	24.4	0.1
43.9%	pH (SU)	7.98	8.08	8.04	0.04	7.49	7.95	7.78	0.19	8.06	8.20	8.13	0.04
	DO (mg/L)	8.0	8.3	8.1	0.2	6.5	7.9	7.4	0.4	8.1	8.2	8.2	0.1
	Conductivity (µmhos/cm)	260	272	264	5								
	Initial Temperature (°C)					24.5	25.0	24.8	0.2	24.4	25.0	24.7	0.2
	Final Temperature (°C)					24.2 ~~24.1~~	24.7	24.4	0.2	24.2	24.6	24.4	0.1
72%	pH (SU)	7.88	8.03	7.98	0.07	7.46	7.95	7.76	0.19	7.99	8.14	8.08	0.05
	DO (mg/L)	8.0	8.5	8.2	0.2	6.4	7.9	7.4	0.5	8.0	8.3	8.2	0.1
	Conductivity (µmhos/cm)	220	228	223	3								
	Initial Temperature (°C)					24.4	25.1	24.8	0.3	24.5	25.0	24.8	0.2
	Final Temperature (°C)					24.1	24.7	24.4	0.2	24.2	24.6	24.4	0.1
100%	pH (SU)	7.75	7.99	7.90	0.10	7.48	7.94	7.74	0.17	7.90	8.10	8.02	0.08
	DO (mg/L)	8.1	8.6	8.3	0.2	6.9	7.7	7.4	0.3	8.0	8.4	8.2	0.1
	Conductivity (µmhos/cm)	177	183	180	2								
	Alkalinity (mg/L $CaCO_3$)	54	56	55	1								
	Hardness (mg/L $CaCO_3$)	66	70	69	2								
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0								
	Initial Temperature (°C)					24.5	25.2	24.9	0.3	24.6	25.0	24.8	0.2
	Final Temperature (°C)					24.2	24.7	24.4	0.2	24.2	24.6	24.4	0.1
100% Intake	pH (SU)	7.73	7.99	7.88	0.10	7.47	8.01	7.77	0.19	7.99	8.22	8.11	0.09
	DO (mg/L)	8.1	8.6	8.3	0.2	7.2	7.8	7.5	0.2	8.0	8.3	8.2	0.1
	Conductivity (µmhos/cm)	175	182	177	2								
	Alkalinity (mg/L $CaCO_3$)	54	59	56	3								
	Hardness (mg/L $CaCO_3$)	66	76	70	5								
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0								
	Initial Temperature (°C)					24.3	25.2	24.8	0.3	24.4	25.3	24.8	0.3
	Final Temperature (°C)					24.2	24.7	24.4	0.2	24.2	24.6	24.4	0.1
Overall Temperature (°C) (including all concentrations for initial and final temperatures)						24.2 ~~24.1~~	25.2	24.6	0.2	24.2	25.3	24.5 ~~24.6~~	0.2

CR 04-03-02

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: February 26-March 05, 2002

Project number: 269

Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.09	8.02	8.08	7.86	8.09	7.92	8.10	7.65	8.10	7.66	8.11	7.93	8.11	8.01
	DO (mg/L)	8.0	7.8	8.0	7.5	7.6	7.6	7.9	7.1	8.0	7.0	8.2	7.5	8.0	7.6
	Conductivity (µmhos/cm)	319		323		314		309		311		313		314	
	Alkalinity (mg/L $CaCO_3$)	69				65									
	Hardness (mg/L $CaCO_3$)	86				86									
	Temperature (°C)	24.4	24.4	24.6	24.7	25.0	24.3	24.7	24.6	24.3	24.2	24.3	24.4	24.7	24.2
10.98%	pH (SU)	8.11	7.98	8.08	7.79	8.12	7.90	8.10	7.56	8.09	7.52	8.11	7.93	8.10	8.00
	DO (mg/L)	8.0	7.9	8.0	7.4	7.8	7.7	7.9	7.1	8.1	6.5	8.1	7.5	8.0	7.4
	Conductivity (µmhos/cm)	309		322		304		308		302		304		310	
	Temperature (°C)	24.6	24.4	24.8	24.7	25.0	24.3	24.9	24.6	24.5	24.2	24.4	24.4	24.7	24.2
22%	pH (SU)	8.11	7.95	8.07	7.76	8.12	7.90	8.10	7.57	8.06	7.50	8.07	7.91	8.09	8.00
	DO (mg/L)	8.0	7.9	8.0	7.4	7.9	7.7	8.0	7.2	8.2	6.4	8.2	7.5	8.0	7.4
	Conductivity (µmhos/cm)	297		307		290		294		289		292		298	
	Temperature (°C)	24.7	24.4	24.8	24.7	24.9	24.3	24.9	24.6	24.5	24.3	24.4	24.4	24.7	24.2
43.9%	pH (SU)	8.08	7.92	8.03	7.77	8.07	7.88	8.07	7.56	7.98	7.49	8.00	7.90	8.07	7.95
	DO (mg/L)	8.0	7.9	8.0	7.3	8.0	7.7	8.0	7.2	8.2	6.5	8.3	7.5	8.0	7.5
	Conductivity (µmhos/cm)	264		272		261		263		260		261		270	
	Temperature (°C)	24.7	24.4	25.0	24.7	25.0	24.3	24.9	24.6	24.5	24.2	24.5	24.4	24.8	24.2
72%	pH (SU)	8.03	7.86	7.98	7.72	8.03	7.86	8.02	7.55	7.88	7.46	7.90	7.89	8.03	7.95
	DO (mg/L)	8.1	7.9	8.0	7.3	8.1	7.7	8.2	7.3	8.4	6.4	8.5	7.6	8.0	7.4
	Conductivity (µmhos/cm)	222		225		220		223		224		222		228	
	Temperature (°C)	24.8	24.4	25.0	24.7	25.1	24.3	25.0	24.6	24.5	24.1	24.4	24.4	24.8	24.2
100%	pH (SU)	7.97	7.80	7.92	7.71	7.95	7.83	7.95	7.48	7.77	7.54	7.75	7.88	7.99	7.94
	DO (mg/L)	8.3	7.7	8.2	7.4	8.2	7.7	8.3	7.4	8.5	6.9	8.6	7.6	8.1	7.4
	Conductivity (µmhos/cm)	177		178		180		178		183		179		183	
	Alkalinity (mg/L $CaCO_3$)	55				54				56					
	Hardness (mg/L $CaCO_3$)	66				70				70					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.4	25.2	24.7	25.2	24.3	25.0	24.6	24.5	24.2	24.6	24.4	24.8	24.2
100% Intake	pH (SU)	7.96	8.01	7.88	7.71	7.92	7.77	7.91	7.47	7.76	7.63	7.73	7.87	7.99	7.95
	DO (mg/L)	8.3	7.8	8.2	7.5	8.2	7.7	8.4	7.4	8.5	7.2	8.6	7.6	8.1	7.6
	Conductivity (µmhos/cm)	177		175		176		176		175		178		182	
	Alkalinity (mg/L $CaCO_3$)	54				54				59					
	Hardness (mg/L $CaCO_3$)	68				66				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.2	24.4	24.9	24.7	24.9	24.3	25.1	24.6	24.3	24.2	24.4	24.4	24.6	24.2

Species: ***Pimephales promelas***

Client: TVA SEQUOYAH - OUTFALL 101 NONTREATED **Date:** 02-26-02

Full-strength Chemistry:

Parameter	Sample Number: 1	2	3	Control Batch: 02-18-02	02-26-02	
pH (S.U.)	7.97	7.95	~~7.75~~ 7.7	8.09	8.09	
DO (mg/L)	8.3	8.2	8.5	8.0	7.6	
Conductivity (µmhos/cm)	177	180	183	319	314	
Alkalinity (mg $CaCO_3$/L)	55	54	56	69	65	
Hardness (mg $CaCO_3$/L)	66	70	70	86	86	
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	02-24-02	02-26-02	02-28-02			
Collection end time	1418	0926	1235			
Grab or Composite (duration)	23-HOUR COMPOSITE	23-HOUR COMPOSITE	23-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.9°C	0.2°C	0.6°C			
Physical characteristics	PALE YELLOW CLEAR	PALE YELLOW CLEAR	PALE YELLOW CLEAR			
Dates sample used	02-26-02 02-27-02	02-28-02 03-01-02	03-02-02 03-03-02 03-04-02			
ETS Project and Sample numbers	269 020226.01	269 020228.01	269 020302.01			

Species: ***Pimephales promelas***

Client: TVA SEQUOYAH - INTAKE NONTREATED

Date: 02-26-02

Full-strength Chemistry:

Parameter	Sample Number:			Control Batch:		
	1	2	3	02-18-02	02-26-02	
pH (S.U.)	7.96	7.92	7.76	8.09	8.09	
DO (mg/L)	8.3	8.2	8.5	8.0	7.6	
Conductivity (µmhos/cm)	177	176	175	319	314	
Alkalinity (mg $CaCO_3$/L)	54	54	59	69	65	
Hardness (mg $CaCO_3$/L)	68	66	76	86	86	
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	02-24-02	02-26-02	02-28-02			
Collection end time	1439	0938	1305			
Grab or Composite (duration)	23-HOUR COMPOSITE	23-HOUR COMPOSITE	23-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.6°C	0.7°C	1.1°C			
Physical characteristics	PALE YELLOW CLEAR	PALE YELLOW CLEAR	PALE YELLOW CLEAR FLOATING PARTICLES			
Dates sample used	02-26-02 02-27-02	02-28-02 03-01-02	03-02-02 03-03-02 03-04-02			
ETS Project and Sample numbers	269 020226.02	269 020228.02	020302.02			

Species: *Pimephales promelas*

Client: TVA SEQUOYAH NONTREATED

Date: 02-26-02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL MHS	pH (S.U.)	8.09	8.02	8.08	7.86	8.09	7.92
	DO (mg/L)	8.0	7.8	8.0	7.5	7.6	7.6
	Conductivity (µmhos/cm)	319		323		314	
	Temperature (°C)	24.4	24.4	24.6	24.7	25.0	24.3
10.98%	pH (S.U.)	8.11	7.98	8.08	7.79	8.12	7.90
	DO (mg/L)	8.0	7.9	8.0	7.4	7.8	7.7
	Conductivity (µmhos/cm)	309		322		304	
	Temperature (°C)	24.6	24.4	24.8	24.7	25.0	24.3
22%	pH (S.U.)	8.11	7.95	8.07	7.76	8.12	7.90
	DO (mg/L)	8.0	7.9	8.0	7.4	7.9	7.7
	Conductivity (µmhos/cm)	297		307		290	
	Temperature (°C)	24.7	24.4	24.8	24.7	24.9	24.3
43.9%	pH (S.U.)	8.08	7.92	8.03	7.77	8.07	7.88
	DO (mg/L)	8.0	7.9	8.0	7.3	8.0	7.7
	Conductivity (µmhos/cm)	264		272		261	
	Temperature (°C)	24.7	24.4	25.0	24.7	25.0	24.3
72%	pH (S.U.)	8.05 ~~8.08~~	7.86	7.98	7.72	8.03	7.86
	DO (mg/L)	~~8.0~~ 8.1	7.9	8.0	7.3	8.1	7.7
	Conductivity (µmhos/cm)	~~264~~ 222		225		220	
	Temperature (°C)	24.8	24.4	25.0	24.7	25.1	24.3
100%	pH (S.U.)	7.97	7.80	7.92	7.71	7.95	7.83
	DO (mg/L)	8.3	7.7	8.2	7.4	8.2	7.7
	Conductivity (µmhos/cm)	177		178		180	
	Temperature (°C)	25.0	24.4	25.2	24.7	25.2	24.3
100% INTAKE	pH (S.U.)	7.96	8.01	7.88	7.71	7.92	7.77
	DO (mg/L)	8.3	7.8	8.2	7.5	8.2	7.7
	Conductivity (µmhos/cm)	177		175		176	
	Temperature (°C)	25.2	24.4	24.9	24.7	24.9	24.3

Species: *Pimephales promelas*

Client: TVA SEQUOYAH NONTREATED

Date: 02-26-02

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL NHS	pH (S.U.)	8.10	7.65	8.10	7.66	8.11	7.93	8.11	8.01
	DO (mg/L)	7.9	7.1	8.0	7.0	8.2	7.5	8.0	7.6
	Conductivity (µmhos/cm)	309		311		313		314	
	Temperature (°C)	24.7	24.6	24.3	24.2	24.3	24.4	24.7	24.2
10.98%	pH (S.U.)	8.10	7.56	8.09	7.52	8.11	7.93	8.10	8.00
	DO (mg/L)	7.9	7.1	8.1	6.5	8.1	7.5	8.0	7.4
	Conductivity (µmhos/cm)	308		302		304		310	
	Temperature (°C)	24.9	24.6	24.5	24.2	24.4	24.4	24.7	24.2
22%	pH (S.U.)	8.10	7.57	8.06	7.50	8.07	7.91	8.09	8.00
	DO (mg/L)	8.0	7.2	8.2	6.4	8.2	7.5	8.0	7.4
	Conductivity (µmhos/cm)	294		289		292		298	
	Temperature (°C)	24.9	24.6	24.5	24.3	24.4	24.4	24.7	24.2
43.9%	pH (S.U.)	8.07	7.56	7.98	7.49	8.00	7.90	8.07	7.95
	DO (mg/L)	8.0	7.2	8.2	6.5	8.3	7.5	8.0	7.5
	Conductivity (µmhos/cm)	263		260		261		270	
	Temperature (°C)	24.9	24.6	24.5	24.2	24.5	24.4	24.8	24.2
72%	pH (S.U.)	8.02	7.55	7.88	7.46	7.90	7.89	8.03	7.95
	DO (mg/L)	8.2	7.3	8.4	6.4	8.5	7.6	8.0	7.4
	Conductivity (µmhos/cm)	223		224		222		228	
	Temperature (°C)	25.0	24.6	24.5	24.1	24.4	24.4	24.8	24.2
100%	pH (S.U.)	7.95	7.48	7.77	7.54	7.75	7.88	7.99	7.94
	DO (mg/L)	8.3	7.4	8.5	6.9	8.6	7.6	8.1	7.4
	Conductivity (µmhos/cm)	178		183		179		183	
	Temperature (°C)	25.0	24.6	24.5	24.2	24.6	24.4	24.8	24.2
100% INTAKE	pH (S.U.)	7.91	7.47	7.76	7.63	7.73	7.87	7.99	7.95
	DO (mg/L)	8.4	7.4	8.5	7.2	8.6	7.6	8.1	7.6
	Conductivity (µmhos/cm)	176		175		178		182	
	Temperature (°C)	25.1	24.6	24.3	24.2	24.4	24.4	24.6	24.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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: February 26-March 05, 2002

Project number: 269

Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.09	8.11	8.08	8.17	8.09	8.08	8.10	8.07	8.10	8.08	8.11	8.16	8.11	8.15
	DO (mg/L)	8.0	8.1	8.0	8.2	7.6	8.0	7.9	8.1	8.0	8.1	8.2	8.0	8.0	8.1
	Conductivity (µmhos/cm)	319		323		314		309		311		313		314	
	Alkalinity (mg/L $CaCO_3$)	69				65									
	Hardness (mg/L $CaCO_3$)	86				86									
	Temperature (°C)	24.3	24.5	24.6	24.4	24.7	24.2	24.6	24.5	24.3	24.6	24.3	24.5	24.7	24.3
10.98%	pH (SU)	8.11	8.14	8.08	8.18	8.12	8.10	8.10	8.09	8.09	8.07	8.11	8.17	8.10	8.17
	DO (mg/L)	8.0	8.1	8.0	8.2	7.8	8.0	7.9	8.1	8.1	8.2	8.1	8.0	8.0	8.0
	Conductivity (µmhos/cm)	309		322		304		308		302		304		310	
	Temperature (°C)	24.5	24.5	24.7	24.4	24.9	24.2	24.7	24.5	24.5	24.6	24.5	24.5	24.7	24.3
22%	pH (SU)	8.11	8.13	8.07	8.19	8.12	8.09	8.10	8.09	8.06	8.07	8.07	8.14	8.09	8.14
	DO (mg/L)	8.0	8.1	8.0	8.2	7.9	8.0	8.0	8.1	8.2	8.2	8.2	8.0	8.0	8.0
	Conductivity (µmhos/cm)	297		307		290		294		289		292		298	
	Temperature (°C)	24.5	24.5	24.7	24.4	24.9	24.2	24.7	24.5	24.5	24.6	24.4	24.5	24.7	24.3
43.9%	pH (SU)	8.08	8.12	8.03	8.20	8.07	8.12	8.07	8.10	7.98	8.06	8.00	8.14	8.07	8.14
	DO (mg/L)	8.0	8.1	8.0	8.2	8.0	8.2	8.0	8.2	8.2	8.2	8.3	8.1	8.0	8.1
	Conductivity (µmhos/cm)	264		272		261		263		260		261		270	
	Temperature (°C)	24.8	24.5	24.9	24.4	25.0	24.2	24.7	24.5	24.6	24.6	24.4	24.5	24.6	24.3
72%	pH (SU)	8.03	8.10	7.98	8.14	8.03	8.08	8.02	8.04	7.88	7.99	7.90	8.07	8.03	8.12
	DO (mg/L)	8.1	8.2	8.0	8.3	8.1	8.3	8.2	8.3	8.4	8.0	8.5	8.2	8.0	8.1
	Conductivity (µmhos/cm)	222		225		220		223		224		222		228	
	Temperature (°C)	24.9	24.5	24.9	24.4	25.0	24.2	24.8	24.5	24.6	24.6	24.5	24.5	24.6	24.3
100%	pH (SU)	7.97	7.97	7.92	8.10	7.95	8.03	7.95	7.90	7.77	7.96	7.75	8.06	7.99	8.10
	DO (mg/L)	8.3	8.2	8.2	8.4	8.2	8.3	8.3	8.3	8.5	8.0	8.6	8.2	8.1	8.2
	Conductivity (µmhos/cm)	177		178		180		178		183		179		183	
	Alkalinity (mg/L $CaCO_3$)	55				54				56					
	Hardness (mg/L $CaCO_3$)	66				70				70					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.9	24.5	25.0	24.4	25.0	24.2	24.7	24.5	24.6	24.6	24.7	24.5	24.7	24.3
100% Intake	pH (SU)	7.96	8.03	7.88	8.12	7.92	8.06	7.91	8.20	7.76	7.99	7.73	8.22	7.99	8.12
	DO (mg/L)	8.3	8.2	8.2	8.3	8.2	8.1	8.4	8.2	8.5	8.0	8.6	8.2	8.1	8.2
	Conductivity (µmhos/cm)	177		175		176		176		175		178		182	
	Alkalinity (mg/L $CaCO_3$)	54				54				59					
	Hardness (mg/L $CaCO_3$)	68				66				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.3	24.5	24.8	24.4	24.9	24.2	24.6	24.5	24.4	24.6	24.9	24.5	24.6	24.3

Species: ***Ceriodaphnia dubia***

Client: TVA SEQUOYAH - OUTFALL 101 NONTREATED **Date:** 02-26-02

Full-strength Chemistry:

Parameter	Sample Number:			Control Batch:		
	1	2	3	02-18-02	02-26-02	
pH (S.U.)	7.97	7.95	7.77	8.09	8.09	
DO (mg/L)	8.3	8.2	8.5	8.0	7.6	
Conductivity (µmhos/cm)	177	180	183	319	314	
Alkalinity (mg $CaCO_3$/L)	~~66~~ 55	~~70~~ 54	~~70~~ 56	69	~~86~~ 65	
Hardness (mg $CaCO_3$/L)	~~85~~ 66	~~54~~ 70	~~56~~ 70	86	86 ~~67~~ ~~65~~	
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	02-24-02	02-26-02	02-28-02			
Collection end time	1418	~~0938~~ 0926	1235			
Grab or Composite (duration)	23-HOUR COMPOSITE	23 HOUR COMPOSITE	23-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.9°C	0.2°C	0.6°C			
Physical characteristics	PALE YELLOW CLEAR	PALE YELLOW CLEAR	PALE YELLOW CLEAR			
Dates sample used	02-26-02 02-27-02	02-28-02 03-01-02	03-02-02 03-03-02 03-04-02			
ETS Project and Sample numbers	269 020226.01	269 020228.01	020302.01			

Species: ***Ceriodaphnia dubia***

Client: TVA SEQUOYAH INTAKE NONTREATED

Date: 02-26-02

Full-strength Chemistry:

Parameter	Sample Number:			Control Batch:		
	1	2	3	02-18-02	02-26-02	
pH (S.U.)	7.96	7.92	7.76	8.09	8.09	
DO (mg/L)	8.3	8.2	8.5	8.0	7.6	
Conductivity (µmhos/cm)	177	176	175	319	314	
Alkalinity (mg $CaCO_3$/L)	54	54	59	69	65	
Hardness (mg $CaCO_3$/L)	68	66	76	86	86	
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	02-24-02	02-26-02	02-28-02			
Collection end time	1439	0936	1305			
Grab or Composite (duration)	23-HOUR COMPOSITE	23-HOUR COMPOSITE	23-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.6°C	0.7°C	1.1°C			
Physical characteristics	PALE YELLOW CLEAR	PALE YELLOW CLEAR	PALE YELLOW CLEAR FLOATING PARTICLES			
Dates sample used	02-26-02 02-27-02	02-28-02 03-01-02	03-02-02 03-03-02 03-04-02			
ETS Project and Sample numbers	269 020226.02	269 020228.02	269 020302.02			

Species: *Ceriodaphnia dubia*

Client: TVA SEQUOYAH NONTREATED **Date:** 02-26-02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL MHS	pH (S.U.)	8.09	8.11	8.08	8.17	8.09	8.08
	DO (mg/L)	8.0	8.1	8.0	8.2	7.6	8.0
	Conductivity (µmhos/cm)	319		323		314	
	Temperature (°C)	24.3	24.5	24.6	24.4	24.7	24.2
10.98%	pH (S.U.)	8.11	8.14	8.08	8.18	8.12	8.10
	DO (mg/L)	8.0	8.1	8.0	8.2	7.8	8.0
	Conductivity (µmhos/cm)	309		322		304	
	Temperature (°C)	24.5	24.5	24.7	24.4	24.9	24.2
22%	pH (S.U.)	8.11	8.13	8.07	8.19	8.12	8.09
	DO (mg/L)	8.0	8.1	8.0	8.2	7.9	8.0
	Conductivity (µmhos/cm)	297		307		290	
	Temperature (°C)	24.5	24.5	24.7	24.4	24.9	24.2
43.9%	pH (S.U.)	8.08	8.12	8.03	8.20	8.07	8.12
	DO (mg/L)	8.0	8.1	8.0	8.2	8.0	8.2
	Conductivity (µmhos/cm)	264		272		261	
	Temperature (°C)	24.8	24.5	24.9	24.4	25.0	24.2
72%	pH (S.U.)	8.03	8.10	7.98	8.14	8.03	8.08
	DO (mg/L)	8.1	8.2	8.0	8.3	8.1	8.3
	Conductivity (µmhos/cm)	222		225		220	
	Temperature (°C)	24.9	24.5	24.9	24.4	25.0	24.2
100%	pH (S.U.)	7.97	7.97	7.92	8.10	7.95	8.03
	DO (mg/L)	8.3	8.2	8.2	8.4	8.2	8.3
	Conductivity (µmhos/cm)	177		178		180	
	Temperature (°C)	24.9	24.5	25.0	24.4	25.0	24.2
100% INTAKE	pH (S.U.)	7.96	8.03	7.88	8.12	7.92	8.06
	DO (mg/L)	8.3	8.2	8.2	8.3	8.2	8.1
	Conductivity (µmhos/cm)	177		175		176	
	Temperature (°C)	25.3	24.5	24.8	24.4	24.9	24.2
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

Client: TVA SEQUOYAH NONTREATED **Date:** 02-26-02

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	8.10	8.07	8.10	8.08	8.11	8.16	8.11	8.15
	DO (mg/L)	7.9	8.1	8.0	8.1	8.2	~~7.8~~ 8.0	8.0	8.1
MHS	Conductivity (µmhos/cm)	309		311		313		314	
	Temperature (°C)	24.6	24.5	24.3	24.6	24.3	24.5	24.7	24.3
	pH (S.U.)	8.10	8.09	8.09	8.07	8.11	8.17	8.16	8.17
	DO (mg/L)	7.9	8.1	8.1	8.2	8.1	8.0	8.0	8.0
10.98%	Conductivity (µmhos/cm)	308		302		304		310	
	Temperature (°C)	24.7	24.5	24.5	24.6	24.5	24.5	24.7	24.3
	pH (S.U.)	8.10	8.09	8.06	8.07	8.07	8.14	8.09	8.14
	DO (mg/L)	8.0	8.1	8.2	8.2	8.2	8.0	8.0	8.0
22%	Conductivity (µmhos/cm)	294		289		292		298	
	Temperature (°C)	24.7	24.5	24.5	24.6	24.4	24.5	24.7	24.3
	pH (S.U.)	8.07	8.10	7.98	8.06	8.00	8.14	8.07	8.14
	DO (mg/L)	8.0	8.2	8.2	8.2	8.3	8.1	8.0	8.1
43.97%	Conductivity (µmhos/cm)	263		260		261		270	
	Temperature (°C)	24.7	24.5	24.6	24.6	24.4	24.5	24.6	24.3
	pH (S.U.)	8.02	8.04	~~7.98~~ 7.98	7.99	7.90	8.07	8.03	8.12
	DO (mg/L)	8.2	8.3	8.4	8.0	8.5	8.2	8.0	8.1
72%	Conductivity (µmhos/cm)	223		224		222		228	
	Temperature (°C)	24.8	24.5	24.6	24.6	24.5	24.5	24.6	24.3
	pH (S.U.)	7.95	7.90	7.77	7.96	7.75	8.06	7.99	8.10
	DO (mg/L)	8.3	8.3	8.5	8.0	8.6	8.2	8.1	8.2
100%	Conductivity (µmhos/cm)	178		183		179		183	
	Temperature (°C)	24.7	24.5	24.6	24.6	24.7	24.5	24.7	24.3
	pH (S.U.)	7.91	8.20	7.76	7.99	7.73	8.22	7.99	8.12
100%	DO (mg/L)	8.4	8.2	8.5	8.0	8.6	8.2	8.1	8.2
INTAKE	Conductivity (µmhos/cm)	176		175		170		182	
	Temperature (°C)	24.6	24.5	24.4	24.6	~~27~~ 24.9	24.5	24.6	24.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, LLC

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

Summary of Chemical Analyses

Client: Sequoyah Nuclear Plant UV-Treated
Test dates: February 26-March 05, 2002
Project number: 269

Reviewed by: J Hunter

Pimephales promelas

Concentration	Parameter	Initial				Final			
		Minimum	Maximum	Mean	S	Minimum	Maximum	Mean	S
Control	pH (SU)	7.93	8.11	8.01	0.06	7.60	7.99	7.86	0.16
	DO (mg/L)	7.6	8.1	7.9	0.2	6.8	8.0	7.4	0.4
	Conductivity (µmhos/cm)	308	340	319	11				
	Alkalinity (mg/L $CaCO_3$)	65	69	67	3				
	Hardness (mg/L $CaCO_3$)	86	86	86	0				
	Initial Temperature (°C)					24.3	24.9	24.6	0.2
	Final Temperature (°C)					24.2	24.7	24.4	0.2
10.98%	pH (SU)	7.95	8.11	8.04	0.06	7.59	7.98	7.85	0.16
	DO (mg/L)	7.6	8.1	7.9	0.2	6.7	7.9	7.4	0.4
	Conductivity (µmhos/cm)	304	324	310	7				
	Initial Temperature (°C)					24.4	25.0	24.8	0.2
	Final Temperature (°C)					24.2	24.7	24.4	0.2
22%	pH (SU)	7.96	8.11	8.05	0.05	7.58	7.96	7.82	0.16
	DO (mg/L)	7.6	8.2	7.9	0.2	6.6	7.9	7.4	0.4
	Conductivity (µmhos/cm)	289	306	295	6				
	Initial Temperature (°C)					24.3	25.2	24.9	0.3
	Final Temperature (°C)					24.2	24.6	24.4	0.1
43.9%	pH (SU)	7.95	8.08	8.03	0.05	7.58	7.94	7.81	0.16
	DO (mg/L)	7.6	8.2	8.0	0.2	6.6	7.9	7.5	0.4
	Conductivity (µmhos/cm)	260	271	264	4				
	Initial Temperature (°C)					24.5	25.2	24.9	0.3
	Final Temperature (°C)					24.2	24.6	24.4	0.1
72%	pH (SU)	7.91	8.04	7.99	0.05	7.55	7.91	7.77	0.15
	DO (mg/L)	7.6	8.4	8.0	0.3	6.7	7.9	7.4	0.4
	Conductivity (µmhos/cm)	219	225	222	2				
	Initial Temperature (°C)					24.4	25.4	25.0	0.3
	Final Temperature (°C)					24.2	25.5	24.6	0.4
100%	pH (SU)	7.85	7.99	7.93	0.06	7.54	7.88	7.76	0.14
	DO (mg/L)	7.6	8.4	8.1	0.3	7.1	7.8	7.5	0.3
	Conductivity (µmhos/cm)	177	185	180	3				
	Alkalinity (mg/L $CaCO_3$)	54	56	55	1				
	Hardness (mg/L $CaCO_3$)	66	70	69	2				
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0				
	Initial Temperature (°C)					24.8	25.4	25.1	0.2
	Final Temperature (°C)					24.2	24.6	24.4	0.1
100% Intake	pH (SU)	7.82	7.98	7.92	0.07	7.52	7.90	7.75	0.15
	DO (mg/L)	7.8	8.5	8.1	0.2	7.2	7.9	7.6	0.2
	Conductivity (µmhos/cm)	174	182	177	3				
	Alkalinity (mg/L $CaCO_3$)	54	59	56	3				
	Hardness (mg/L $CaCO_3$)	66	76	70	5				
	Total Residual Chlorine (mg/L)	< 0.10	< 0.10	< 0.10	0				
	Initial Temperature (°C)					24.7	25.3	25.0	0.2
	Final Temperature (°C)					24.2	24.6	24.4	0.1

Overall Temperature (°C) (including all concentrations for initial and final temperatures)	24.2	25.5	24.7	0.2

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: February 26-March 05, 2002

Project number: 269

Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	8.00	7.97	8.06	7.91	8.04	7.99	8.11	7.60	7.93	7.64	7.94	7.94	8.02	7.94
	DO (mg/L)	8.0	8.0	8.0	7.4	7.9	7.6	7.7	7.2	8.1	6.8	7.6	7.5	7.9	7.5
	Conductivity (µmhos/cm)	318		340		308		327		312		316		312	
	Alkalinity (mg/L $CaCO_3$)	69				65									
	Hardness (mg/L $CaCO_3$)	86				86									
	Temperature (°C)	24.5	24.3	24.4	24.7	24.9	24.4	24.8	24.6	24.5	24.2	24.3	24.5	24.8	24.3
10.98%	pH (SU)	8.02	7.98	8.07	7.87	8.07	7.95	8.11	7.59	7.95	7.64	7.98	7.94	8.05	7.95
	DO (mg/L)	8.0	7.9	8.0	7.5	8.0	7.6	7.7	7.3	8.1	6.7	7.6	7.5	7.9	7.5
	Conductivity (µmhos/cm)	311		324		304		311		306		307		308	
	Temperature (°C)	24.8	24.3	24.7	24.7	25.0	24.4	24.8	24.6	24.7	24.4	24.4	24.5	24.9	24.2
22%	pH (SU)	8.05	7.96	8.06	7.83	8.08	7.91	8.11	7.60	7.96	7.58	8.00	7.94	8.06	7.94
	DO (mg/L)	8.0	7.9	8.0	7.5	8.0	7.7	7.7	7.3	8.2	6.6	7.6	7.5	7.9	7.5
	Conductivity (µmhos/cm)	297		306		292		296		289		290		294	
	Temperature (°C)	25.0	24.4	25.0	24.6	25.2	24.4	25.0	24.5	24.7	24.4	24.3	24.5	24.8	24.2
43.9%	pH (SU)	8.04	7.94	8.03	7.78	8.07	7.91	8.08	7.60	7.95	7.58	7.98	7.93	8.04	7.91
	DO (mg/L)	8.0	7.9	8.0	7.5	8.2	7.7	7.8	7.3	8.2	6.6	7.6	7.6	7.9	7.6
	Conductivity (µmhos/cm)	262		271		262		265		260		261		264	
	Temperature (°C)	25.0	24.4	25.2	24.6	25.2	24.4	25.0	24.5	24.7	24.3	24.5	24.5	25.0	24.2
72%	pH (SU)	8.01	7.87	7.98	7.75	8.04	7.86	8.04	7.59	7.91	7.55	7.94	7.89	8.02	7.91
	DO (mg/L)	8.0	7.9	8.0	7.4	8.4	7.7	7.8	7.3	8.3	6.7	7.6	7.5	8.0	7.6
	Conductivity (µmhos/cm)	219		223		220		223		222		222		225	
	Temperature (°C)	25.0	24.3	25.2	24.6	25.4	24.4	25.1	24.5	24.8	24.4	24.4	25.5	25.0	24.2
100%	pH (SU)	7.95	7.85	7.92	7.74	7.98	7.86	7.98	7.54	7.85	7.59	7.87	7.88	7.99	7.88
	DO (mg/L)	8.2	7.8	8.1	7.4	8.4	7.8	8.0	7.3	8.4	7.1	7.6	7.6	8.0	7.7
	Conductivity (µmhos/cm)	177		177		180		180		182		180		185	
	Alkalinity (mg/L $CaCO_3$)	55				54				56					
	Hardness (mg/L $CaCO_3$)	66				70				70					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.3	25.4	24.6	25.4	24.3	25.1	24.5	24.8	24.5	24.9	24.5	25.0	24.2
100% Intake	pH (SU)	7.95	7.85	7.91	7.67	7.95	7.86	7.97	7.52	7.83	7.62	7.82	7.85	7.98	7.90
	DO (mg/L)	8.2	7.9	8.0	7.5	8.3	7.8	8.0	7.5	8.5	7.2	7.8	7.6	8.0	7.6
	Conductivity (µmhos/cm)	174		174		176		174		178		179		182	
	Alkalinity (mg/L $CaCO_3$)	54				54				59					
	Hardness (mg/L $CaCO_3$)	68				66				76					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	24.9	24.3	25.0	24.6	25.2	24.4	24.7	24.5	25.1	24.4	25.3	24.5	24.9	24.2

Species: ***Pimephales promelas***

Client: TVA-SEQUOYAH - OUTFALL 101 UV-TREATED **Date:** 02-26-02

Full-strength Chemistry:

Parameter	Sample Number:			Control Batch:		
	1	2	3	02-18-02	02-26-02	
pH (S.U.)	7.95	7.98	7.85	8.00	8.04	
DO (mg/L)	8.2	8.4	8.4	8.0	7.9	
Conductivity (µmhos/cm)	177	180	182	318	308	
Alkalinity (mg $CaCO_3$/L)	55	54	56	69	65	
Hardness (mg $CaCO_3$/L)	66	70	70	86	86	
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	02-24-02	02-26-02	02-28-02			
Collection end time	1418	0926	1235			
Grab or Composite (duration)	23-HOUR COMPOSITE	23-HOUR COMPOSITE	23-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.9°C	0.2°C	0.6°C			
Physical characteristics	~~02-26-02~~ ~~02-27-02~~ PALE YELLOW CLEAR	PALE YELLOW CLEAR	PALE YELLOW CLEAR			
Dates sample used	02-26-02 02-27-02	02-28-02 ~~02-29-02~~ 03-01-02	03-02-02 03-03-02 03-04-02			
ETS Project and Sample numbers	269 020226.01	269 020228.01	020302.01			

Species: ***Pimephales promelas***

Client: TVA - SEQUOYAH - INTAKE UV-TREATED

Date: 02-26-02

Full-strength Chemistry:

Parameter	Sample Number: 1	2	3	Control Batch: 02-18-02	02-26-02	
pH (S.U.)	7.95	7.95	7.83	8.00	8.04	
DO (mg/L)	8.2	8.3	8.5	8.0	7.9	
Conductivity (µmhos/cm)	174	176	178	318	308	
Alkalinity (mg $CaCO_3$/L)	54	54	59	69	65	
Hardness (mg $CaCO_3$/L)	68	66	76	86	86	
Chlorine (mg/L)	<0.10	<0.10	<0.10			
Collection start date	02-24-02	02-26-02	02-28-02			
Collection end time	1439	0938	1305			
Grab or Composite (duration)	23-HOUR COMPOSITE	23-HOUR COMPOSITE	23-HOUR COMPOSITE			
Temperature (°C) upon receipt	0.6°C	0.7°C	1.1°C			
Physical characteristics	PALE YELLOW CLEAR	PALE YELLOW CLEAR	PALE YELLOW CLEAR FLOATING PARTICLES			
Dates sample used	02-26-02 02-27-02	02-28-02 ~~02-29-02~~ 03-01-02	03-02-02 03-03-02 03-04-02			
ETS Project and Sample numbers	269 ~~020260~~ 020226.02	269 020228.02	020302.02			

Species: *Pimephales promelas*

Client: TVA - SEQUOYAH UV-TREATED

Date: 02-26-02

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
		Initial	Final	Initial	Final	Initial	Final
CONTROL MHS	pH (S.U.)	8.00	7.97	8.06	7.91	8.04	7.99
	DO (mg/L)	8.0	8.0	8.0	7.4	7.9	7.6
	Conductivity (µmhos/cm)	318		340		308	
	Temperature (°C)	24.5	24.3	24.4	24.7	24.9	24.4
10.98%	pH (S.U.)	8.02	7.98	8.07	7.87	8.07	7.95
	DO (mg/L)	8.0	7.9	8.0	7.5	8.0	7.6
	Conductivity (µmhos/cm)	311		324		304	
	Temperature (°C)	24.8	24.3	24.7	24.7	25.0	24.4
22%	pH (S.U.)	8.05	7.96	8.06	7.83	8.08	7.91
	DO (mg/L)	8.0	7.9	8.0	7.5	8.0	7.7
	Conductivity (µmhos/cm)	297		306		292	
	Temperature (°C)	25.0	24.4	25.0	24.6	25.2	24.4
43.9%	pH (S.U.)	8.04	7.94	8.03	7.78	8.07	7.91
	DO (mg/L)	8.0	7.9	8.0	7.5	8.2	7.7
	Conductivity (µmhos/cm)	262		271		262	
	Temperature (°C)	25.0	24.4	25.2	24.6	25.2	24.4
72%	pH (S.U.)	8.01	7.87	7.98	7.75	8.04	7.86
	DO (mg/L)	8.0	7.9	8.0	7.4	8.4	7.7
	Conductivity (µmhos/cm)	219		223		220	
	Temperature (°C)	25.0	24.3	25.2	24.6	25.4	24.4
100%	pH (S.U.)	7.95	7.85	7.92	7.74	7.98	7.86
	DO (mg/L)	8.2	7.8	8.1	7.4	8.4	7.8
	Conductivity (µmhos/cm)	177		177		180	
	Temperature (°C)	25.1	24.3	25.4	24.6	25.4	24.3
100% INTAKE	pH (S.U.)	7.95	7.85	7.91	7.67	7.95	7.86
	DO (mg/L)	8.2	7.9	8.0	7.5	8.3	7.8
	Conductivity (µmhos/cm)	174		174		176	
	Temperature (°C)	24.9	24.3	25.0	24.6	25.2	24.4

Species: ***Pimephales promelas***

Client: TVA-SEQUOYAH UV-TREATED **Date:** 02-26-02

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	8.11	7.60	7.93	7.64	7.94	7.94	8.02	7.94
	DO (mg/L)	7.7	7.2	8.1	6.8	7.6	7.5	7.9	7.5
MHS	Conductivity (µmhos/cm)	327		312		316		312	
	Temperature (°C)	24.8	24.6	24.5	24.2	24.3	24.5	24.8	24.3
10.98%	pH (S.U.)	8.11	7.59	7.95	7.64	7.98	7.94	8.05	7.95
	DO (mg/L)	7.7	7.3	8.1	6.7	7.6	7.5	7.9	7.5
	Conductivity (µmhos/cm)	311		306		307		308	
	Temperature (°C)	24.8	24.6	24.7	24.4	24.4	24.5	24.9	24.2
22%	pH (S.U.)	8.11	7.60	7.96	7.58	8.00	7.94	8.06	7.94
	DO (mg/L)	7.7	7.3	8.2	6.6	7.6	7.5	7.9	7.5
	Conductivity (µmhos/cm)	296		289		290		294	
	Temperature (°C)	25.0	24.5	24.7	24.4	24.3	24.5	24.8	24.2
43.97%	pH (S.U.)	8.08	7.60	7.95	7.58	7.98	7.93	8.04	7.91
	DO (mg/L)	7.8	7.3	8.2	6.6	7.6	7.6	7.9	7.6
	Conductivity (µmhos/cm)	265		260		261		264	
	Temperature (°C)	25.0	24.5	24.7	24.3	24.5	24.5	25.0	24.2
72%	pH (S.U.)	8.04	7.59	7.91	7.55	7.94	7.89	8.02	7.91
	DO (mg/L)	7.8	7.3	8.3	6.7	7.6	7.5	8.0	7.6
	Conductivity (µmhos/cm)	223		222		222		225	
	Temperature (°C)	25.1	24.5	24.8	24.4	24.4	24.5	25.0	24.2
100%	pH (S.U.)	7.98	7.54	7.85	~~7.85~~ 7.59	7.87	7.88	7.99	7.88
	DO (mg/L)	8.0	7.3	8.4	7.1	7.6	7.6	8.0	7.7
	Conductivity (µmhos/cm)	180		182		180		185	
	Temperature (°C)	25.1	24.5	24.8	24.5	24.9	24.5	25.0	24.2
100% INTAKE	pH (S.U.)	7.97	7.52	7.83	7.62	7.82	7.85	7.98	7.90
	DO (mg/L)	8.0	7.5	8.5	7.2	7.8	7.6	8.0	7.6
	Conductivity (µmhos/cm)	174		178		179		182	
	Temperature (°C)	24.7	24.5	25.1	24.4	25.3	24.5	24.9	24.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KLK
Date analyzed	02-26-02

Iodide reagent:	1NR041
Acid reagent:	1NR023
Slope:	27.8

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	1NSS005	1NSS005

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%)
1NSS005	0.50	0.492	98.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
020226.02	SQN-Int	pale yellow, clear	S <0.00896	
↓	Duplicate		D <0.00674	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00912
020226.01	SQN-EA	pale yellow, clear	<0.00497

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%)
1NSS005	0.50	0.514	102.8%

Reviewed by	
Date reviewed	02-27-02

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KHL
Date analyzed	02.28.02

Iodide reagent:	1NR041
Acid reagent:	1NR023
Slope:	26.0

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	1NS5005	1NS5005

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%)
1NS5005	0.50	0.522	104.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
020228.01	SQN OUTFALL 101	pale yellow, clear	S <0.00212	
↓	Duplicate		D <0.00201	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00472
020228.02	SQN INTAKE	pale yellow, clear	<0.00310

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%)
1NS5005	0.50	0.544	108.8%

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

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KLT
Date analyzed	03-02-02

Iodide reagent:	1NR041
Acid reagent:	1NR023
Slope:	27.8

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	1NSS005	1NSS105

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%)
1NSS005	0.50	0.468	93.6%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
020302 01	SQN Outfall 01	pale yellow, clear	S <0.00369	
↓	Duplicate		D <0.00341	–

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00409
020302.02	SQN INT	pale yellow, clear, floating particles	<0.00365

KLT

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%)
1NSS005	0.50	0.481	96.2%

Reviewed by	[illegible]
Date reviewed	03-02-02

Alkalinity
(EPA Method 310.1)

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

Analyst: KEK

Date analyzed: 03-05-02

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
6.4	IN2030	INSS079	0.2	12.8	12.6	0.0198	9.9

Blk correct 0.1 - 0.2 = 0.1ml

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS079	100	100	12.8	22.5	9.7	9.9	96	96%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
02-26-02 B	MHS H_2O	100	22.6	29.4	6.8	9.9	S 67	
02-26-02	Duplicate	100	29.4	36.1	6.7	9.9	D 66	1.5%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS079	50	100	29.4	40.1	10.7	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%)
66	44	88

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
02-26-02 A	MHS H_2O	100	40.1	46.7	6.6	9.9	65
03-01-02	MHS H_2O		0.0	6.5	6.5		64
03-04-02	SSW H_2O		13.0	16.0	3.0		30
020226.01	SQN 101 1		16.0	21.6	5.6		55
020228.01	2		21.6	27.0	5.4		54
020302.01	3		27.1	32.8	5.7		56
020226.02	SQN INtake 1		32.8	38.2	5.4		54
020228.02	2		38.2	43.7	5.5		54
020302.02	3		43.7	49.7	6.0		59
03-04-02	MHS		6.4	13.0	6.9		63

Reviewed by: [signature]

Date reviewed: 03-05-02

Alkalinity
(EPA Method 310.1)

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

Analyst: KEL
Date analyzed:

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%)
	100	100						

Duplicate sample precision:

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

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)

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

KEL

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
TV= 3.125	MDL STUDY 1	100	~~39.0~~ 29.0	30.0	0.2	9.9	1.98
	2		30.0	30.4	0.4		3.96
	3		30.4	30.7	0.3		2.97
	4		30.8	31.2	0.4		3.96
	5		31.2	31.5	0.3		2.97
	6		31.6	31.9	0.3		2.97
	7		31.9	32.1	0.3		2.97

KEL

Reviewed by: [illegible] Date reviewed: 03-05-02

Environmental Testing Solutions, LLC

Total Hardness
(EPA Method 130.2)

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

Analyst	KEr
Date analyzed	03-05-02

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
INR011	IN8209	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%)
INS5008	40	50	10.0	12.0	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%)
02.26.02A	MHS H2O	50	12.0	16.3	4.3	20	S 86	
02.26.02A	Duplicate	50	16.3	20.8	4.5	20	D 90	4.5%

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)
INS5008	40	50	16.3	22.9	6.6	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
02.26.02 B	MHS H2O		22.9	27.2	4.3		86
03-01-02	MHS H2O		27.2	31.6	4.4		88
03.04.02	SSW H2O		36.0	38.1	2.1		42
020226.01	SQN 101 1		38.1	41.4	3.3		66
020228.01	2		41.5	45.0	3.5		70
~~020228~~ 020302.01	3		45.0	48.5	3.5		70
020226.02	SQN Intake 1		1.4	4.8	3.4		68
020228.02	2		4.9	8.2	3.3		66
020302.02	3		8.2	12.0	3.8		76
03.04.02	MHS H2O		31.6	36.0	4.4		88

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

Reviewed by: [illegible]

Date reviewed: 03-05-02

Total Hardness
(EPA Method 130.2)

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

Analyst	KLK
Date analyzed	03-05-02

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%)
	40	50						

Duplicate sample precision:

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

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)

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

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	~~Blank~~ (should be = 0 mg $CaCO_3$/L)						
TV= 3.0	MDL Study 1	50	12.0	12.2	0.2	20	4.0
	2		12.2	12.4	0.2		4.0
	3		12.5	12.6	0.1		2.0
	4		12.6	12.8	0.2		4.0
	5		12.8	13.0	0.2		4.0
	6		13.0	13.1	0.1		2.0
	7		13.1	13.3	0.2		4.0

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

Reviewed by: [illegible]

Date reviewed 03-05-02

Sequoyah Nuclear Plant Biomonitoring
February 26 – March 05, 2002

Appendix D

Reference Toxicant Test and
Control Chart Information

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 IC25 (g KCl/L)	CT (g/L KCl)	S	$S_{A.75}$	$S_{A.90}$	CV
1	03-17-00	0.68					
2	05-23-00	0.69	0.68	0.01	0.26	0.31	0.01
3	06-13-00	0.72	0.70	0.03	0.26	0.31	0.04
4	06-13-00	0.70	0.70	0.02	0.26	0.31	0.03
5	09-19-00	0.66	0.69	0.03	0.26	0.31	0.04
6	10-24-00	0.77	0.70	0.04	0.27	0.32	0.06
7	11-07-00	0.65	0.70	0.04	0.26	0.31	0.06
8	03-13-01	0.69	0.69	0.04	0.26	0.31	0.05
9	06-26-01	0.53	0.68	0.06	0.26	0.30	0.09
10	07-17-01	0.74	0.68	0.06	0.26	0.31	0.09
11	08-21-01	0.62	0.68	0.06	0.26	0.30	0.09
12	09-25-01	0.60	0.67	0.06	0.25	0.30	0.10
13	11-01-01	0.71	0.67	0.06	0.26	0.30	0.09
14	11-06-01	0.66	0.67	0.06	0.26	0.30	0.09
15	11-27-01	0.57	0.67	0.06	0.25	0.30	0.10
16	12-12-01	0.63	0.66	0.06	0.25	0.30	0.09
17	01-04-02	0.49	0.65	0.07	0.25	0.29	0.11
18	02-05-02	0.61	0.65	0.07	0.25	0.29	0.11
19	02-13-02	0.65	0.65	0.07	0.25	0.29	0.11
20	02-26-02	0.56	0.65	0.07	0.25	0.29	0.11

Note: **7-d IC25** – 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 IC25).

S = Standard deviation of the IC25 values.

$S_{A.75}$ – Standard deviation corresponding to the the 75th percentile CV.
$S_{A.75}$ = 0.38, as determined by USEPA for the method and endpoint.

$S_{A.90}$ – Standard deviation corresponding to the the 90th percentile CV.
$S_{A.90}$ = 0.45, as determined by the USEPA for the method and endpoint.

CV = Coefficient of variation of the IC25 values.

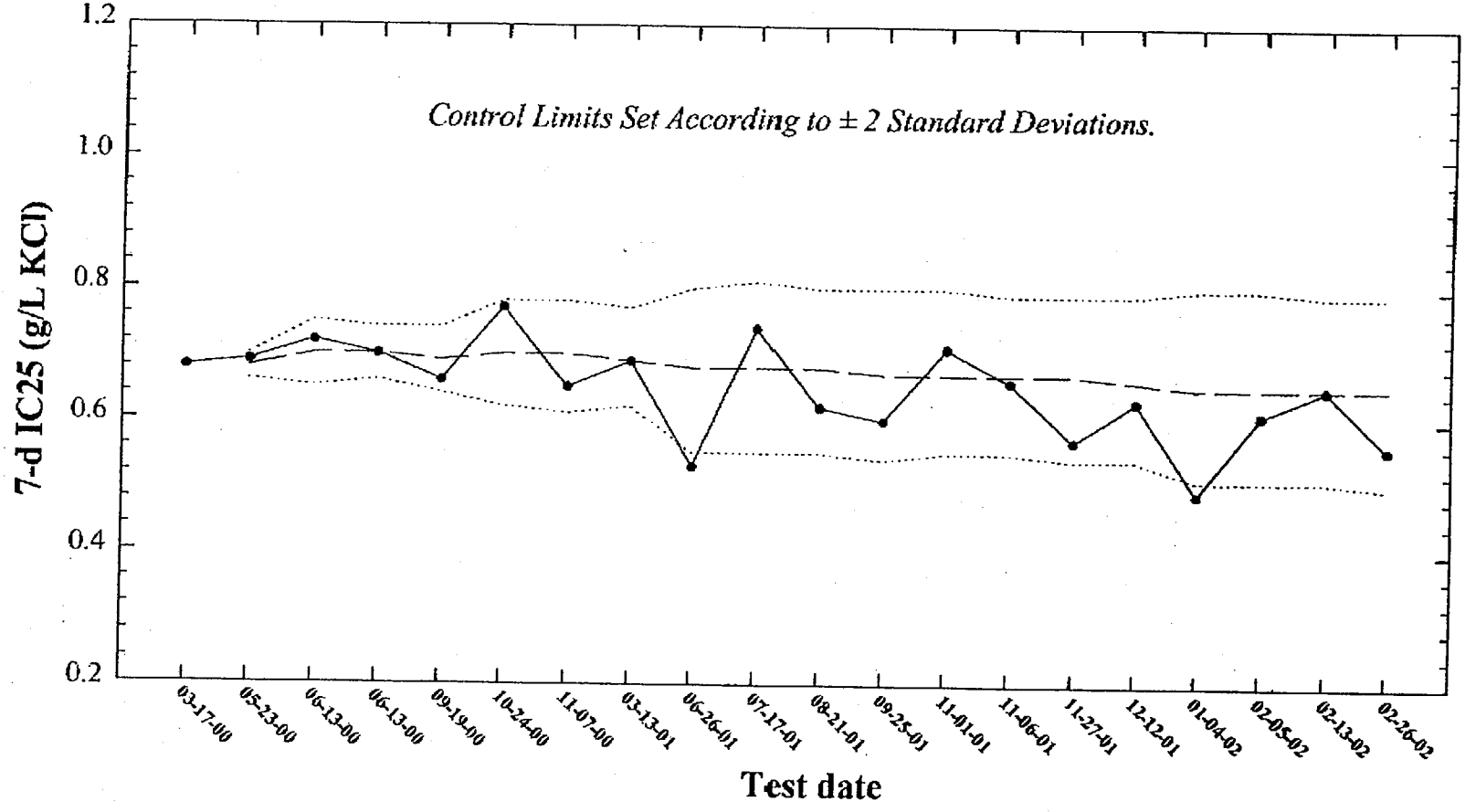
USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatic BioSystems, Inc.

02-26-02.xls

Environmental Testing Solutions, LLC

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



- **7-day IC25** = 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 IC25)
- **Control Limits** (mean IC25 ± 2 Standard Deviations)

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	03-17-00	97.5	0.40	7.5		0.06	15.7	
2	05-23-00	100	0.31	3.6	5.5	0.07	21.2	18.4
3	06-13-00	100	0.45	10.1	7.1	0.10	22.2	19.7
4	06-13-00	100	0.58	13.2	8.6	0.12	20.0	19.7
5	09-19-00	100	0.67	5.3	7.9	0.07	11.2	18.0
6	10-24-00	97.5	0.83	13.3	8.8	0.22	26.9	19.5
7	11-07-00	97.5	0.67	10.5	9.1	0.13	19.3	19.5
8	03-13-01	92.5	0.34	6.5	8.8	0.08	22.8	19.9
9	06-26-01	100	0.63	9.8	8.9	0.19	30.6	21.1
10	07-17-01	100	0.52	9.1	8.9	0.07	13.8	20.4
11	08-21-01	100	0.89	8.3	8.8	0.13	15.1	19.9
12	09-25-01	100	0.85	4.9	8.5	0.09	10.4	19.1
13	11-01-01	100	0.54	2.5	8.0	0.10	18.6	19.1
14	11-06-01	100	1.00	7.4	8.0	0.17	16.9	18.9
15	11-27-01	97.5	0.70	22.8	9.0	0.18	26.1	19.4
16	12-12-01	95	0.82	16.6	9.5	0.19	23.5	19.6
17	01-04-02	95	0.80	10.1	9.5	0.18	22.0	19.8
18	02-05-02	97.5	0.95	6.9	9.4	0.21	22.2	19.9
19	02-13-02	100	0.65	8.0	9.3	0.10	15.5	19.7
20	02-26-02	100	0.64	3.3	9.0	0.11	16.5	19.5

Note:

CV = Coefficient of variation for control survival.
On average, the CV for control growth is 9.0% 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 19.5% 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.

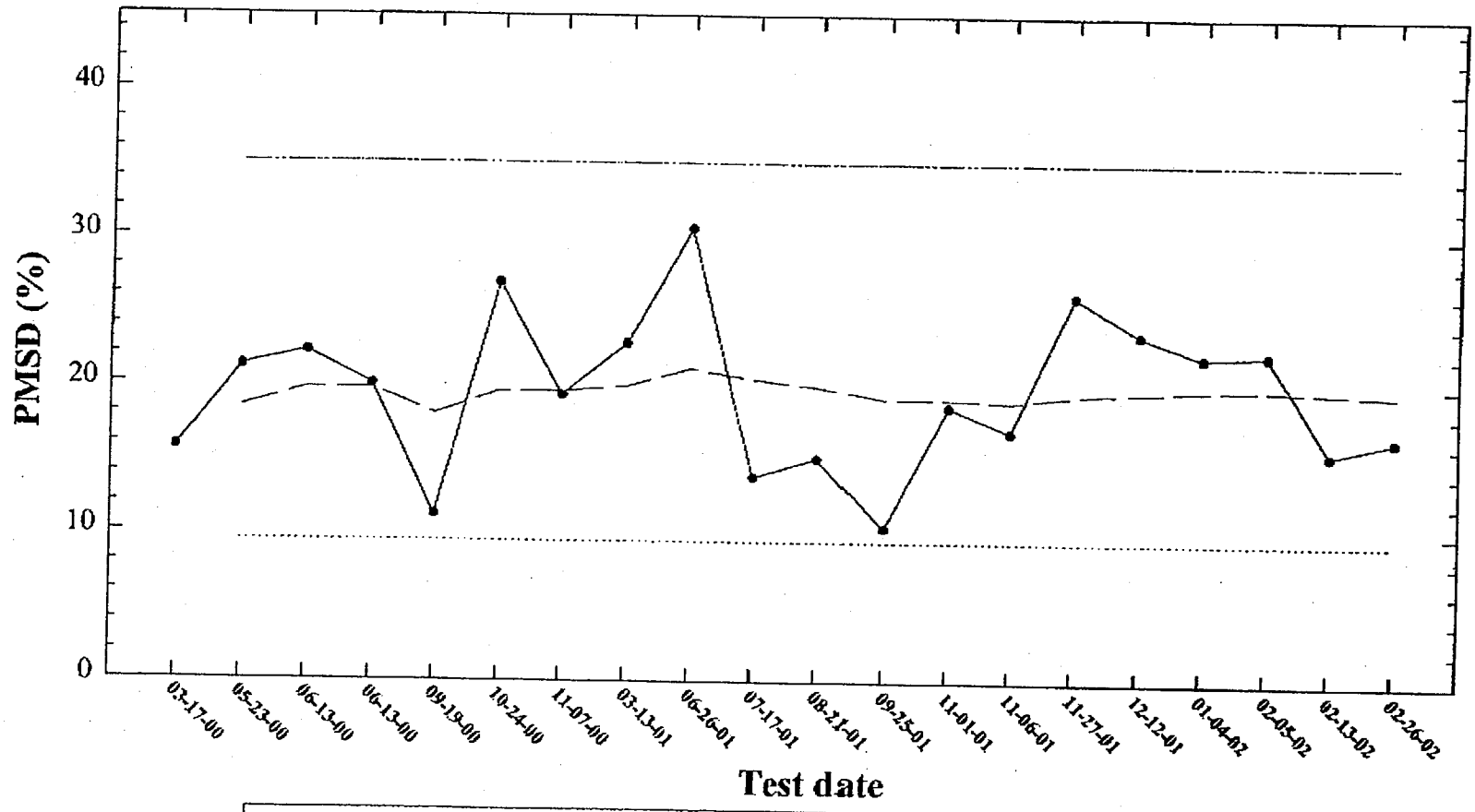
Organisms obtained from Aquatic BioSystems, Inc.

02-26-02.xls

Environmental Testing Solutions, LLC

Precision of Endpoint Measurements

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



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

— - **Central Tendency** (mean PMSD)

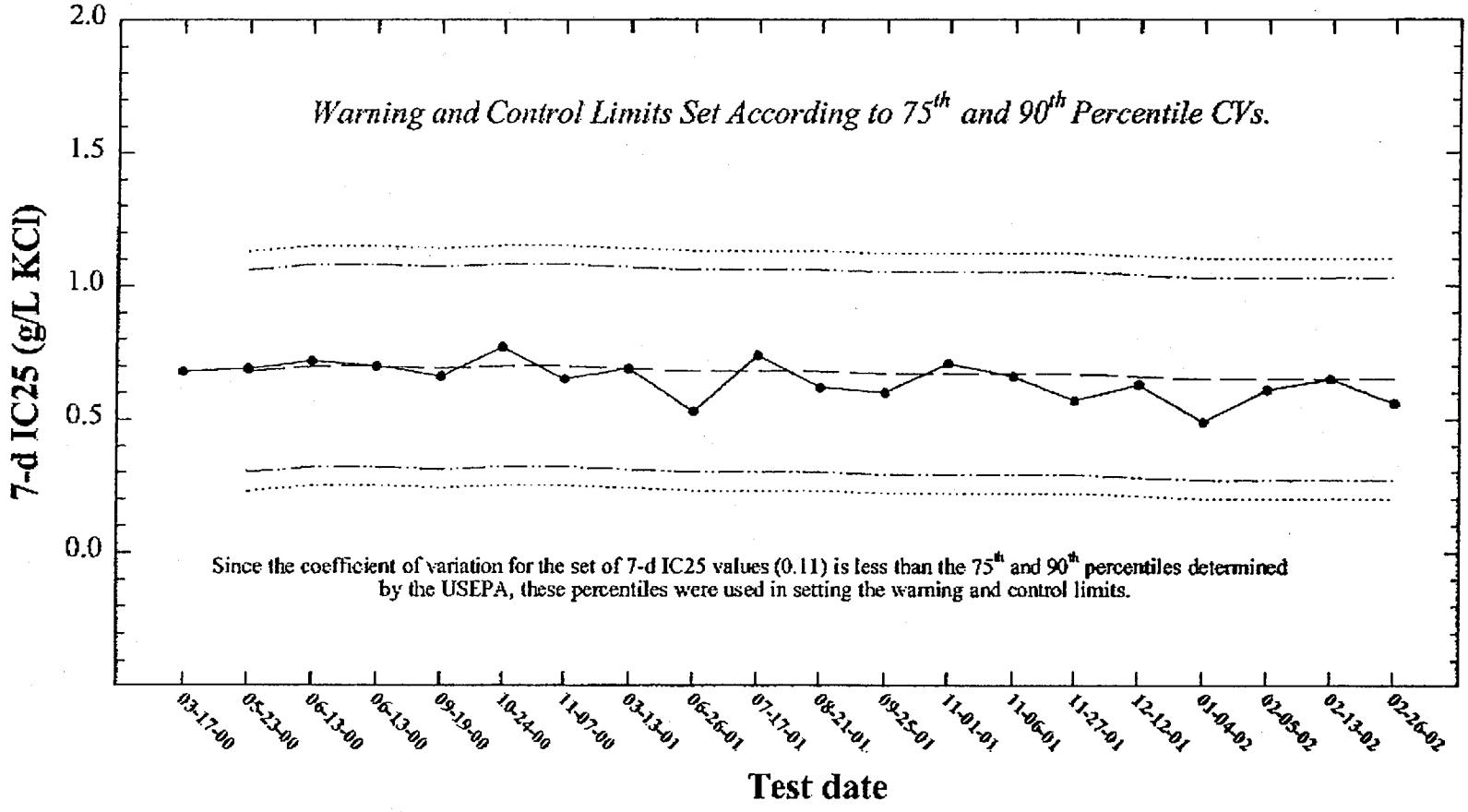
····· **Lower and Upper PMSD Bounds**

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

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

Environmental Testing Solutions, LLC

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



- **7-day IC25** = 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 IC25)
- **Warning Limits** (mean IC25 ± $S_{A.75}$, $S_{A.75}$ = 0.38, as determined by USEPA for the method and endpoint)
- **Control Limits** (mean IC25 ± $S_{A.90}$, $S_{A.90}$ = 0.45, as 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: 13

Dilution preparation information:						*Comments:*
KCl CHM number:		CHM 067				
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:		*Test information:*	
Organism age:	24-HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	02-25-02 1330 TO 1500 HST	Incubator number:	2
Organism source:	ABS BATCH 02-25-02	*Artemia* lot number:	860207P
Transfer bowl information:	pH = 7.93 Temperature = 24.2°C	Oven temperature:	60°C
		Drying time:	24-HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Analyst
0	02-26-02	——	1440	1438	JI
1	02-27-02	0851	1450	1448	JI
2	02-28-02	0847	1450	1437	JI
3	03-01-02	0850	1450	1444	JI
4	03-02-02	1100	1700	1450	KEK
5	03-03-02	0937	1540	1451	KEK
6	03-04-02	0850	1450	1432	JI
7	03-05-02	——	——	1454	JI

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC50	796.8
Average weight per larvae:	0.6416	≥ 0.25 mg/larvae	NOEC	300
			LOEC	450
			ChV	367.4
			IC25	561.4

PpKClCR Test Number: 13

Survival and Growth Data

Day	CONTROL				300 mg KCl/L				450 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	9[1d]	10	10	10
7	10	10	10	10	10	10	10	10	9	10	10	10
A = Pan weight (mg)	15.096	14.926	14.721	14.960	14.591	14.663	14.650	14.892	15.024	15.136	15.137	14.693
B = Pan + Larvae weight (mg)	21.76	21.45	20.88	21.34	19.89	21.98	20.66	21.20	20.30	19.44	21.15	20.32
Larvae weight (mg) = A – B	6.664	6.464	6.156	6.380	5.299	7.317	6.010	6.308	5.276	4.304	6.013	5.697

Calculations and data reviewed: JH

Comments:

PpKClCR Test Number: 13

Survival and Growth Data

Day	600 mg KCl/L				750 mg KCl/L				900 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	9 1d	9 1d	8 2d	9 1d
2	10	10	10	10	8 2d	9 1d	8 2d	10	6 3d	4 5d	4 4d	5 4d
3	9 1d	10	10	10	8	9	8	8 2d	5 1d	4	4	5
4	8 1d	10	10	10	7 1d	9	8	8	5	4	4	4 1d
5	8	10	10	10	7	9	8	8	5	4	3 1d	3 1d
6	8	9 1d	10	9 1d	6 1d	9	8	8	5	3 1d	1 2d	3
7	8	9	10	9	5 1d	7 2d	8	8	5	0 3d	1	3
A = Pan weight (mg)	14.735	14.777	15.032	14.932	14.960	14.658	14.964	14.701	15.042	15.062	15.098	15.050
B = Pan + Larvae weight (mg)	19.41	19.54	20.36	18.61	17.39	18.65	19.54	19.24	18.48	—	15.74	16.69
Larvae weight (mg) = A – B	4.675	4.763	5.328	3.774	2.430	3.992	4.576	4.539	3.438	—	0.642	1.660

Calculations and data reviewed: JL

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 # 13

Test dates: February 26 - March 5, 2002

Reviewed by: J Humphrey

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	10	15.096	21.760	6.664	0.6664	100.0	0.6416	3.3	Not applicable
	B	10	10	14.986	21.450	6.464	0.6464				
	C	10	10	14.724	20.880	6.156	0.6156				
	D	10	10	14.960	21.340	6.380	0.6380				
300	E	10	10	14.591	19.890	5.299	0.5299	100.0	0.6234	13.4	2.8
	F	10	10	14.663	21.980	7.317	0.7317				
	G	10	10	14.650	20.660	6.010	0.6010				
	H	10	10	14.892	21.200	6.308	0.6308				
450	I	10	9	15.024	20.300	5.276	0.5276	97.5	0.5323	14.0	17.0
	J	10	10	15.136	19.440	4.304	0.4304				
	K	10	10	15.137	21.150	6.013	0.6013				
	L	10	10	14.623	20.320	5.697	0.5697				
600	M	10	8	14.735	19.410	4.675	0.4675	90.0	0.4635	13.9	27.8
	N	10	9	14.777	19.540	4.763	0.4763				
	O	10	10	15.032	20.360	5.328	0.5328				
	P	10	9	14.836	18.610	3.774	0.3774				
750	Q	10	5	14.960	17.390	2.430	0.2430	70.0	0.3884	25.9	39.5
	R	10	7	14.658	18.650	3.992	0.3992				
	S	10	8	14.964	19.540	4.576	0.4576				
	T	10	8	14.701	19.240	4.539	0.4539				
900	U	10	5	15.042	18.480	3.438	0.3438	22.5	0.1435	104.5	77.6
	V	10	0	0.000	0.000	0.000	0.0000				
	W	10	1	15.098	15.740	0.642	0.0642				
	X	10	3	15.030	16.690	1.660	0.1660				

Dunnett's MSD value: 0.1059

PMSD: 16.5

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 19.5% from the control (determined

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 15 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 Survival

Start Date:	2/26/02	Test ID:	#pKCICR	Sample ID:	REF-Ref Toxicant
End Date:	3/5/02	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	1.0000	1.0000	1.0000	1.0000
300	1.0000	1.0000	1.0000	1.0000
450	0.9000	1.0000	1.0000	1.0000
600	0.9000	0.9000	1.0000	0.9000
750	0.5000	0.7000	0.8000	0.8000
900	0.5000	0.0000	0.1000	0.3000

Conc-mg/L	Mean	N-Mean	Transform: Arcsin Square Root Mean	Min	Max	CV%	N	Rank Sum	T-Tailed Critical	Number Resp	Total Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
300	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
450	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
600	0.9000	0.9000	1.2543	1.1071	1.4120	9.935	4	12.00	10.00	4	40
*750	0.7000	0.7000	0.9977	0.7854	1.1071	15.209	4	10.00	10.00	12	40
*900	0.2250	0.2250	0.4614	0.1588	0.7854	60.016	4	10.00	10.00	31	40

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro Wilk's Test indicates normal distribution (p > 0.01)	0.909702837	0.884	0.06165438	1.843071675
Equality of variance cannot be confirmed				

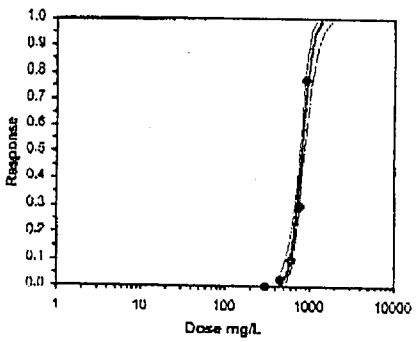
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.8203932	

Maximum Likelihood-Probit

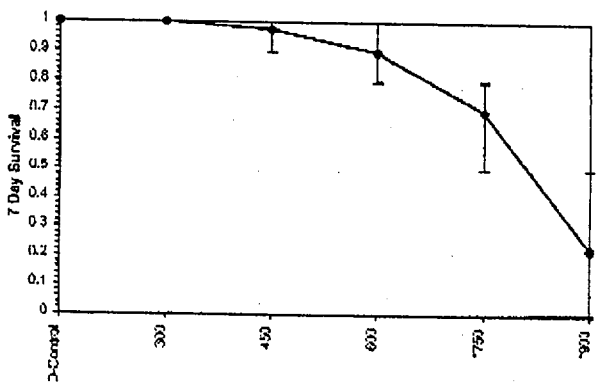
Parameter	Value	SE	95% Fiducial Limits	
Slope	9.977103854	1.612947851	6.815726005	13.1384817
Intercept	23.9469513	4.6378333	33.037124	-14.8567387
TSCR				

Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
0	4.674592804	7.814724922	0.2	2.401336075	0.100229487	4

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	465.7656107	369.8056936	527.5117472
EC05	3.355	545.0963063	468.5367177	597.1533412
EC10	3.718	592.7708247	521.7634336	639.2218739
EC15	3.964	627.2705409	564.2265543	670.3349733
EC20	4.158	656.1162779	599.5033199	697.2108689
EC25	4.326	681.9182495	630.494463	722.2941238
EC40	4.747	751.5246426	708.4287074	797.8950594
EC50	5.000	796.775692	753.0595956	854.7923122
EC60	5.253	844.7514216	798.8695786	921.1017792
EC75	5.674	930.9788958	865.6587725	1051.106579
EC80	5.842	967.589935	893.644289	1109.356219
EC85	6.036	1012.085657	926.8082584	1182.105314
EC90	6.282	1070.989755	969.6213096	1281.338834
EC95	6.645	1164.659301	1035.790694	1445.271369
EC99	7.326	1363.02796	1170.41176	1814.935049



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

02-26-02.xls

Environmental Testing Solutions, LLC

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	2/26/02	Test ID:	PpKCKR	Sample ID:	RFF-Ref Toxicant
End Date:	3/5/02	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	0.6664	0.6464	0.6156	0.6380
300	0.5299	0.7317	0.6010	0.6308
450	0.5276	0.4304	0.6013	0.5897
600	0.4675	0.4763	0.5328	0.3774
750	0.2430	0.3992	0.4576	0.4539
900	0.1438	0.0000	0.0642	0.1660

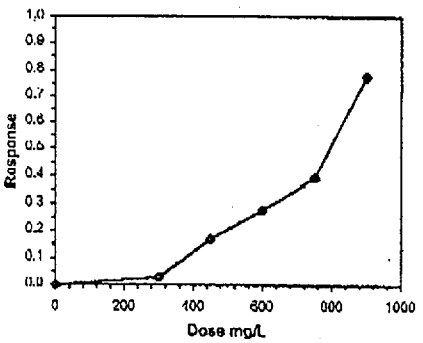
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6416	1.0000	0.6416	0.6156	0.6664	3.278	4				0.6416	1.0000
300	0.6234	0.9716	0.6234	0.5299	0.7317	13.431	4	0.395	2.290	0.1059	0.6234	0.9716
*450	0.5323	0.8296	0.5323	0.4304	0.6013	13.901	4	2.364	2.290	0.1059	0.5323	0.8296
*600	0.4635	0.7224	0.4635	0.3774	0.5328	13.868	4	3.852	2.290	0.1059	0.4635	0.7224
750	0.3884	0.6054	0.3884	0.2430	0.4576	25.889	4				0.3884	0.6054
900	0.1435	0.2237	0.1435	0.0000	0.1438	104.535	4				0.1435	0.2237

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.947348237	0.844	0.20382248	0.08622002
Bartlett's Test indicates equal variances (p = 0.25)	4.091785431	11.34486201		

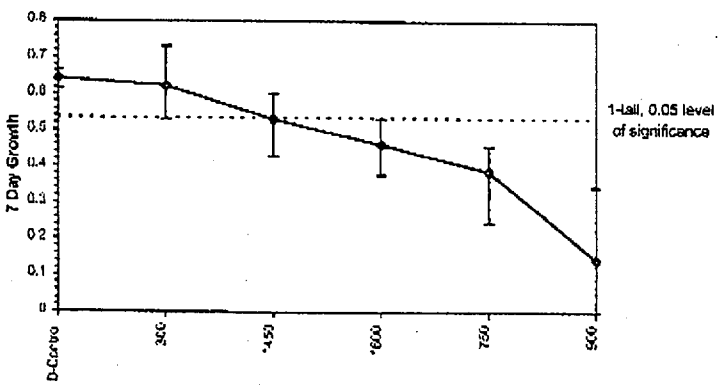
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	300	450	367.4234614		0.105889988	0.165040505	0.027529297	0.004276107	0.017608022	3, 12

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	322.77	85.15	0.00	391.67	-0.7586
IC10	375.59	61.88	134.11	575.04	0.6725
IC15	428.41	51.60	260.19	552.99	-0.2637
IC20	491.39	52.71	330.12	672.53	0.2739
IC25	561.38	55.62	359.26	683.24	-0.2973
IC40	752.12	40.32	575.60	817.68	-0.8809
IC50	791.42	26.66	675.56	856.02	-0.6026



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

02-26-02.xls

PpKClCR Test Number: 13

MHS Control Chemistry:

Parameter	Control Batch:		
	02-18-02	02-26-02	
pH (S.U.)	8.09	8.09	
DO (mg/L)	8.0	7.6	
Conductivity (µmhos/cm)	319	314	
Alkalinity (mg $CaCO_3$/L)	69	65	
Hardness (mg $CaCO_3$/L)	86	86	

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

Environmental Testing Solutions, LLC

PpKClCR Test Number: 13

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	8.09	8.00	8.08	7.85	8.09	7.90
	DO (mg/L)	8.0	7.9	8.0	7.3	7.6	7.7
	Conductivity (µmhos/cm)	319		323		314	
	Temperature (°C)	24.3	24.3	24.5	24.3	24.5	24.6
300 mg KCl/L	pH (S.U.)	8.21	8.00	8.15	7.87	8.14	7.95
	DO (mg/L)	8.0	7.9	8.0	7.3	7.6	7.7
	Conductivity (µmhos/cm)	918		882		856	
	Temperature (°C)	24.4	24.3	24.5	24.3	24.6	24.5
450 mg KCl/L	pH (S.U.)	8.21	7.98	8.17	7.93	8.15	7.96
	DO (mg/L)	8.1	8.0	8.2	7.3	7.6	7.7
	Conductivity (µmhos/cm)	1206		1148		1136	
	Temperature (°C)	24.4	24.3	24.5	24.3	24.6	24.5
600 mg KCl/L	pH (S.U.)	8.22	8.00	8.18	7.91	8.17	8.02
	DO (mg/L)	8.1	8.0	8.3	7.3	7.6	7.8
	Conductivity (µmhos/cm)	1483		1433		1422	
	Temperature (°C)	24.3	24.3	24.5	24.3	24.6	24.5
750 mg KCl/L	pH (S.U.)	8.22	8.01	8.17	7.92	8.17	8.00
	DO (mg/L)	8.2	8.0	8.3	7.3	7.6	7.9
	Conductivity (µmhos/cm)	1746		1702		1689	
	Temperature (°C)	24.3	24.3	24.5	24.3	24.6	24.5
900 mg KCl/L	pH (S.U.)	8.23	8.00	8.18	7.95	8.18	8.00
	DO (mg/L)	8.2	8.0	8.3	7.4	7.7	8.0
	Conductivity (µmhos/cm)	1967		1919		1927	
	Temperature (°C)	24.3	24.3	24.5	24.3	24.6	24.5
		Initial	Final	Initial	Final	Initial	Final

72000 70800 70200

Environmental Testing Solutions, LLC

PpKClCR Test Number: 13

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
CONTROL	pH (S.U.)	8.10	7.62	8.10	7.80	8.11	7.78	8.11	8.01
	DO (mg/L)	7.9	7.1	8.0	7.8	8.2	7.6	8.0	7.6
	Conductivity (µmhos/cm)	309		311		313		314	
	Temperature (°C)	24.4	24.7	24.2	24.3	24.3	24.4	24.6	24.2
300 mg KCl/L	pH (S.U.)	8.18	7.72	8.15	7.73	8.17	7.79	8.18	7.99
	DO (mg/L)	8.2	7.2	7.9	7.2	8.2	7.7	8.2	7.6
	Conductivity (µmhos/cm)	864		829		882		883	
	Temperature (°C)	24.3	24.7	24.2	24.3	24.3	24.5	24.6	24.2
450 mg KCl/L	pH (S.U.)	8.20	7.75	8.18	7.73	8.19	7.82	8.18	8.02
	DO (mg/L)	8.2	7.1	8.1	7.3	8.1	7.7	8.2	7.5
	Conductivity (µmhos/cm)	1121		1107		1144		1146	
	Temperature (°C)	24.4	24.6	24.2	24.3	24.3	24.5	24.6	24.2
600 mg KCl/L	pH (S.U.)	8.20	7.86	8.18	7.81	8.19	7.87	8.18	8.01
	DO (mg/L)	8.2	7.6	8.1	7.3	8.2	7.7	8.3	7.5
	Conductivity (µmhos/cm)	1395		1394		1418		1434	
	Temperature (°C)	24.4	24.7	24.2	24.3	24.3	24.5	24.6	24.2
750 mg KCl/L	pH (S.U.)	8.20	7.78	8.19	7.80	8.20	7.87	8.19	8.00
	DO (mg/L)	8.3	7.6	8.4	7.5	8.2	7.7	8.2	7.6
	Conductivity (µmhos/cm)	1653		1656		1688		1685	
	Temperature (°C)	24.4	24.7	24.2	24.2	24.3	24.5	24.6	24.2
900 mg KCl/L	pH (S.U.)	8.22	7.72	8.20	7.78	8.21	7.87	8.19	8.09
	DO (mg/L)	8.2	7.4	8.4	7.2	8.2	7.8	8.3	7.7
	Conductivity (µmhos/cm)	1860		1877		1897		1900	
	Temperature (°C)	24.4	24.7	24.2	24.3	24.3	24.5	24.6	24.2
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
		68600		69300		68700		71700	

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	12-13-00	100	21.8	11.6		2.6	11.8	
2	12-17-00	100	24.0	16.0	13.8	3.5	14.6	13.2
3	12-17-00	100	25.6	4.6	10.7	3.3	12.9	13.1
4	12-19-00	100	24.8	9.5	10.4	4.6	18.4	14.4
5	12-19-00	100	25.1	19.2	12.2	5.0	19.8	15.5
6	01-09-01	100	28.0	8.4	11.6	3.5	12.4	15.0
7	02-06-01	100	22.1	10.1	11.3	3.1	14.2	14.9
8	03-07-01	100	24.0	8.3	11.0	2.4	10.1	14.3
9	04-04-01	100	25.0	10.0	10.9	2.9	11.8	14.0
10	05-09-01	100	27.9	8.9	10.7	3.1	11.0	13.7
11	06-06-01	100	27.8	5.8	10.2	3.5	12.5	13.6
12	07-10-01	100	25.0	9.4	10.1	2.8	11.2	13.4
13	08-08-01	100	30.9	2.4	9.6	2.7	8.7	13.0
14	09-12-01	100	28.6	6.6	9.3	2.7	9.4	12.8
15	10-10-01	100	24.9	8.8	9.3	2.5	9.9	12.6
16	11-01-01	100	27.0	6.5	9.1	3.1	11.6	12.5
17	12-05-01	100	24.8	9.1	9.1	4.8	19.5	12.9
18	01-09-02	100	27.5	7.5	9.0	4.5	16.3	13.1
19	02-05-02	100	23.1	10.1	9.1	2.6	11.1	13.0

Note:

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is **9.1%** 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 **13.0%** from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

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

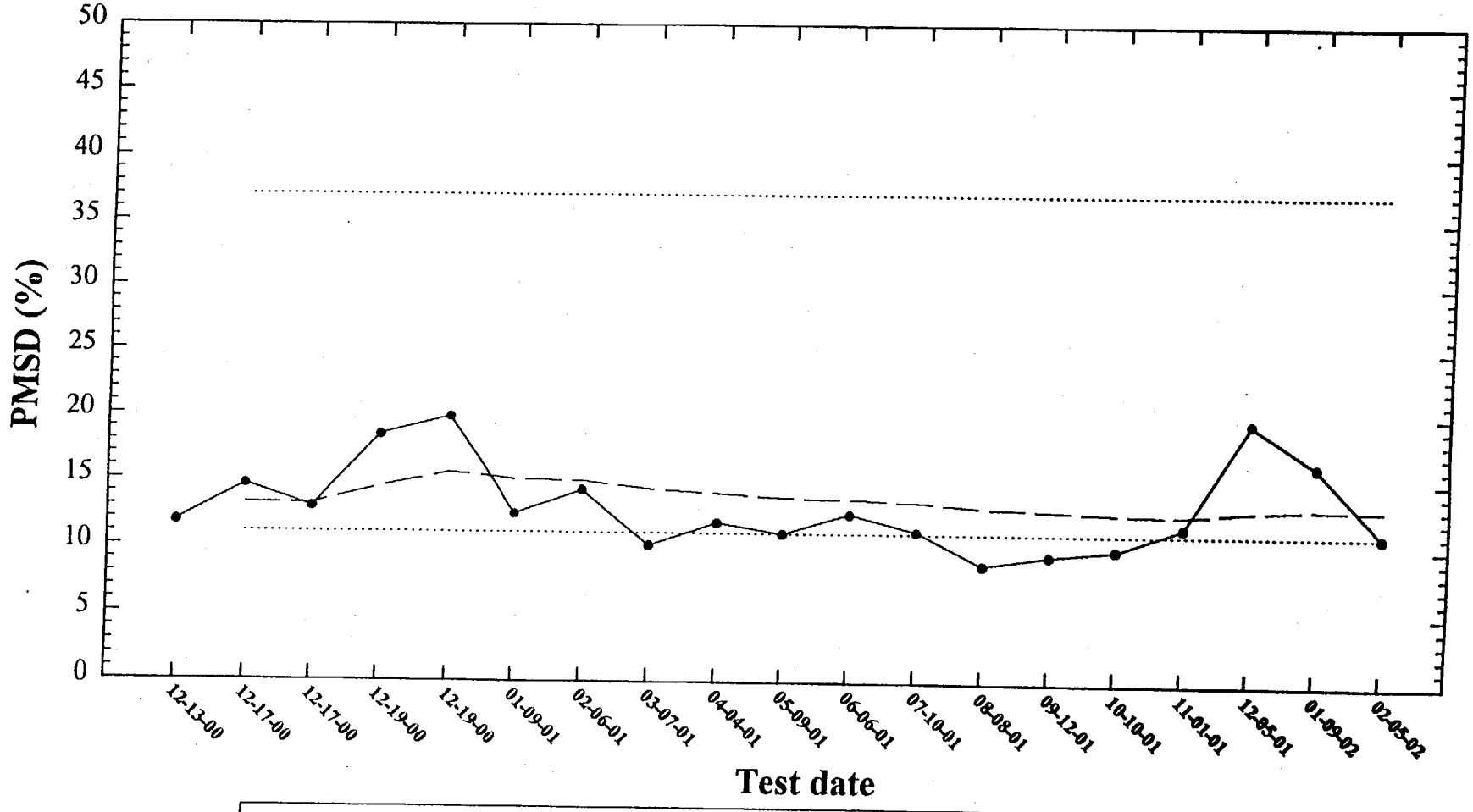
The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

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*

	Date	Time	Analyst
Test start	02-05-02	1337	JL
Test end	02-12-02	1340	JL

CdNaClCR Test Number: 19

Dilution preparation information:						*Comments:*
NaCl CHM number:	CHM 060					
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:	Yellow
Date and times organisms were born between:	02-04-02 1538 TO 1801	Incubator number:	2
Organism source:	01-29-02 A&B	YCT batch: ABS	01-23-02
Transfer bowl information:	pH = 8.08 Temperature (°C)=24.6	*Selenastrum* batch: ABS	01-23-02

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	0	4	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	0	3	3	4	4	5	6	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	6	7	6	6	8	7	8	8	8	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	13	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	12	0	12	10	10	13	12	11	14	10
Total young produced		22	24	21	19	22	24	25	25	27	22
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: JL

Test Renewal, Feeding, and Randomization Record Label

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Date	02-11	02-05	02-06	02-07	02-08	02-09	02-10
Time	1310	1331	1342	1342	1328	1322	1300
Analyst	JL	JL	JL	JL	JL	JL	JL
Shelf Location	C3	C3	C3	C3	C3	C3	C3

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:	23.1	≥ 15.0 offspring/female	ChV	894.4
% CV:	10.1	< 40.0 %	IC25	1072.5

CdNaClCR Test Number: 19

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	3	0	4	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	1	3	0	4	3	4	5	4	6	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	7	8	6	6	9	7	8	6	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	12	0	0	0	0	0	0	0	1	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	13	10	10	11	12	12	10	13	11
Total young produced		24	23	22	20	20	25	24	22	~~25~~ 24	25
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	~~23.0~~ 23.1
% Reduction from Control:	~~0.4%~~ 0%

Calculations and data reviewed: [illegible]

800 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	4	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	3	0	4	4	4	4	5	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	6	6	8	7	7	6	10	6	7	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	3	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	12	10	10	14	12	9	11	10	14	12
Total young produced		25	19	22	25	23	19	25	21	24	24
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	22.7
% Reduction from Control:	1.7%

Calculations and data reviewed: [illegible]

CdNaClCR Test Number: 19

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	3	3	2	3	4	3	5	2	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	6	9	7	9	7	6	6	7	7
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	11	8	10	10	11	9	10	10	9	8
Total young produced		22	17	22	19	23	20	19	21	18	18
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	19.9
% Reduction from Control:	13.9%

Calculations and data reviewed: dl

1200 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	2	3	3	1	2	3	2	2	2	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	6	5	6	6	4	4	1	7	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	2	0	4	0	0	0	6	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	6+1d	0	0	11	0	8	9	5	1	0
Total young produced		16	9	10	18	12	15	15	8	16	9
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	12.8
% Reduction from Control:	44.6%

Calculations and data reviewed: dl

CdNaClCR Test Number: 19

1400 mg NaCl/L

Survival and Reproduction Data

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	4.9
% Reduction from Control:	78.8%

Calculations and data reviewed: [illegible]

Environmental Testing Solutions, LLC

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	2/5/02	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	2/12/02	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	22.000	24.000	21.000	19.000	22.000	24.000	25.000	25.000	27.000	22.000
600	24.000	23.000	22.000	20.000	20.000	25.000	24.000	22.000	26.000	25.000
800	25.000	19.000	22.000	25.000	23.000	19.000	25.000	21.000	24.000	24.000
1000	22.000	17.000	22.000	19.000	23.000	20.000	19.000	21.000	18.000	18.000
1200	16.000	9.000	10.000	18.000	12.000	15.000	15.000	8.000	16.000	9.000
1400	5.000	7.000	2.000	4.000	5.000	6.000	7.000	7.000	6.000	0.000

Conc-mg/L	Mean	N-Mean	Transform: Untransformed Mean	Min	Max	CV%	N	t-Stat	1-Tailed Critical	MSD	Isotonic Mean	N-Mean
D-Control	23.100	1.0000	23.100	19.000	27.000	10.091	10				23.100	1.0000
600	23.100	1.0000	23.100	20.000	26.000	9.000	10	0.000	2.287	2.571	23.100	1.0000
800	22.700	0.9827	22.700	19.000	25.000	10.394	10	0.356	2.287	2.571	22.700	0.9827
*1000	19.900	0.8615	19.900	17.000	23.000	10.175	10	2.846	2.287	2.571	19.900	0.8615
*1200	12.800	0.5541	12.800	8.000	18.000	28.241	10	9.161	2.287	2.571	12.800	0.5541
*1400	4.900	0.2121	4.900	0.000	7.000	47.570	10	16.188	2.287	2.571	4.900	0.2121

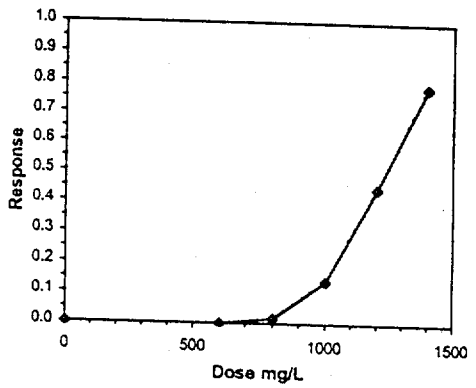
Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	1.013699293	1.035	-0.269182039	-0.769287695
Bartlett's Test indicates equal variances (p = 0.49)	4.451159	15.08631706		

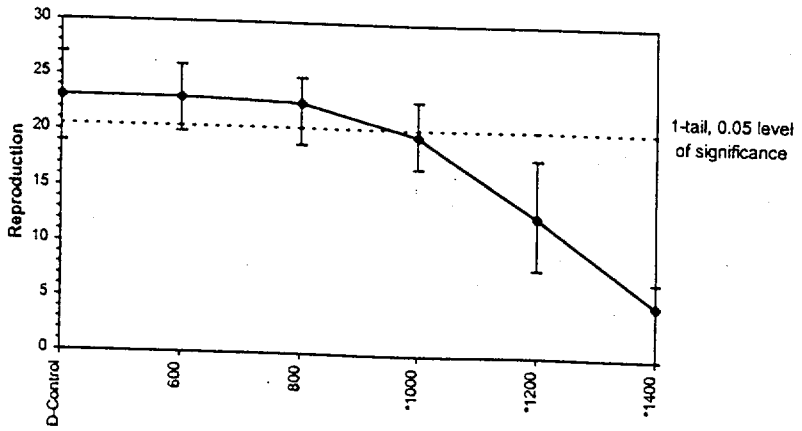
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		2.570923277	0.11129538	551.99	6.32037037	1.3E-24	5, 54

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	853.9285714	124.9585875	406.5833333	897.604249	-1.9012
IC10	936.4285714	55.25304671	788.8666667	1003.449466	-0.7789
IC15	1007.464789	37.55514641	890.1826923	1033.676681	-1.2226
IC20	1040	20.52487717	984.5714286	1066.136275	-0.3918
IC25	1072.535211	19.23479909	1030.745614	1100.905816	0.0937
IC40	1170.140845	25.77623754	1123.013068	1213.401099	0.3315
IC50	1231.64557	24.33635566	1176.598681	1265.472561	-0.1609



Dose-Response Plot



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 #19

Test dates: February 5-12, 2002

Reveiwed by:

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	22	24	21	19	22	24	25	25	27	22	100	23.1	18.1	Not applicable
600	24	23	22	20	20	25	24	22	26	25	100	23.1	9.0	0.0
800	25	19	22	25	23	19	25	21	24	24	100	22.7	10.4	1.7
1000	22	17	22	19	23	20	19	21	18	18	100	19.9	10.2	13.9
1200	16	9	10	18	12	15	15	8	16	9	100	12.8	28.2	44.6
1400	5	7	2	4	5	6	7	7	6	0	100	4.9	47.6	78.8

Dunnett's MSD value: 2.571

PMSD: 11.1

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, LLC chronic toxicity tests when a toxicant reduces Ceriodaphnia reproduction by 13.0% from the control.

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

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

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

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

CdNaClCR Test Number: 19

MHS Control Chemistry:

Parameter	Control Batch:		
	02-04-02	02-07-02	
pH (S.U.)	8.10	8.09	
DO (mg/L)	7.9	7.7	
Conductivity (µmhos/cm)	306	324	
Alkalinity (mg $CaCO_3$/L)	64	66	
Hardness (mg $CaCO_3$/L)	88	90	

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

Recalculating acceptable ranges
- range for guidance only.

CdNaClCR Test Number: 19

Daily Chemistry:

Concentration	Parameter	Day 0		Day 1		Day 2	
CONTROL	pH (S.U.)	8.10	8.10	8.08	8.08	8.04	8.04
	DO (mg/L)	7.9	8.1	7.8	8.2	7.8	8.1
	Conductivity (µmhos/cm)	306 ~~337~~		309		319	
	Temperature (°C)	24.8	24.2	24.2	24.5	24.5	24.3
600 mg NaCl/L	pH (S.U.)	8.14	8.12	8.12	8.09	8.13	8.09
	DO (mg/L)	8.0	8.0	7.8	8.1	8.0	8.2
	Conductivity (µmhos/cm)	1680		1458 ~~1494~~		1494	
	Temperature (°C)	24.8	24.2	24.3	24.5	24.6	24.3
800 mg NaCl/L	pH (S.U.)	8.15	8.17	8.14	8.08	8.12	8.10
	DO (mg/L)	8.0	8.0	7.8	8.2	8.1	8.2
	Conductivity (µmhos/cm)	1901		1827		1828	
	Temperature (°C)	24.8	24.2	24.3	24.5	24.5	24.3
1000 mg NaCl/L	pH (S.U.)	8.14	8.12	8.14	8.08	8.12	8.11
	DO (mg/L)	8.0	8.1	7.8	8.2	8.1	8.2
	Conductivity (µmhos/cm)	2330		2193		2193	
	Temperature (°C)	24.8	24.2	24.2	24.5	24.5	24.3
1200 mg NaCl/L	pH (S.U.)	8.14	8.12	8.14	8.08	8.12	8.10
	DO (mg/L)	8.0	8.0	7.9	8.2	8.1	8.3
	Conductivity (µmhos/cm)	2710		2560		2570	
	Temperature (°C)	24.8	24.2	24.2	24.5	24.5	24.3
1400 mg NaCl/L	pH (S.U.)	8.14	8.14	8.15	8.07	8.12	8.09
	DO (mg/L)	8.1	8.0	8.0	8.2	8.1	8.3
	Conductivity (µmhos/cm)	3080		2930		2896	
	Temperature (°C)	24.8	24.2	24.3	24.5	24.5	24.3
		Initial	Final	Initial	Final	Initial	Final

STOCK CONDUCTIVITY 116300 111400 110900

CdNaClCR Test Number: 19

Concentration	Parameter	Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
CONTROL	pH (S.U.)	8.09	8.23	8.10	8.10	8.09	8.17	8.10	8.16
	DO (mg/L)	7.7	8.2	8.0	8.0	7.8	8.0	7.8	7.8
	Conductivity (µmhos/cm)	324		324		316		311	
	Temperature (°C)	24.2	24.4	24.4	24.3	24.3	24.5	24.3	24.6
600 mg NaCl/L	pH (S.U.)	8.13	8.23	8.14	8.08	8.16	8.15	8.17	8.14
	DO (mg/L)	8.0	8.3	8.0	8.0	7.9	8.0	8.0	7.8
	Conductivity (µmhos/cm)	1500		1462		1496		1576	
	Temperature (°C)	24.2	24.4	24.4	24.3	24.3	24.5	24.3	24.6
800 mg NaCl/L	pH (S.U.)	8.12	8.23	8.14	8.10	8.16	8.14	8.16	8.14
	DO (mg/L)	8.3	8.2	8.1	8.0	7.9	8.0	8.0	7.8
	Conductivity (µmhos/cm)	1870		1824		1866		1906	
	Temperature (°C)	24.2	24.3	24.4	24.3	24.3	24.4	24.3	24.6
1000 mg NaCl/L	pH (S.U.)	8.12	8.24	8.15	8.10	8.17	8.14	8.15	8.14
	DO (mg/L)	8.3	8.1	8.1	8.0	7.9	8.0	8.2	7.8
	Conductivity (µmhos/cm)	2250		2203		2247		2380	
	Temperature (°C)	24.2	24.4	24.4	24.3	24.3	24.5	24.3	24.6
1200 mg NaCl/L	pH (S.U.)	8.13	8.23	8.16	8.11	8.16	8.14	8.15	8.14
	DO (mg/L)	8.4	8.2	8.3	8.0	8.0	8.0	8.3	7.8
	Conductivity (µmhos/cm)	2026		2250		2021		2740	
	Temperature (°C)	24.2	24.4	24.4	24.3	24.3	24.5	24.3	24.6
1400 mg NaCl/L	pH (S.U.)	8.13	8.23	8.16	8.13	8.16	8.13	8.15	8.15
	DO (mg/L)	8.4	8.2	8.4	8.0	8.0	8.0	8.3	7.9
	Conductivity (µmhos/cm)	2987		2887		2964		3150	
	Temperature (°C)	24.2	24.4	24.4	24.3	24.3	24.5	24.3	24.6

111700 110200 109700 111000

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: Diedre B. Nida

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	03	01	To	02	03	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	********	********	**	7.3	********	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	177	227	(26)	********	18	23	(19)	0	4 / 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	<49	<52	(26)	********	<5	<5	(19)	0	4 / 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	1.074	1.247	(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.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	04	11
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

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

ATTN: Diedre B. Nida

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	03	01	To	02	03	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			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
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.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	04	11
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here*
No 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: Diedre B. Nida

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	03	01	To	02	03	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 AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**		********		(12)			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	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		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Diedre B. Nida

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

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

Form Approved.
OMB No. 2040-0004

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	02	03	01	To	02	03	31

*** NO DISCHARGE [ ] ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
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										
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	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

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

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

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: Diedre B. Nida

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	03	01	To	02	03	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		
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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: Diedre B. Nida

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	03	01	To	02	03	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 AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
OXYGEN, DISSOLVED (DO)	SAMPLE MEASUREMENT	********	********	**		********	********	(19)			
00300 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	2.0 DAILY MN	********	********	MG/L		TWICE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		(19)			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	100 DAILY MX	MG/L		TWICE/ WEEK	GRAB
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	********	********	**	********	********		(25)			
00545 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	ML/L		ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			(03)	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	*		ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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.	Diedre B. Nida Environmental Supervisor	423	843-6700	02	04	11
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

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