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

August 11, 2005

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

Attention: Mr. Chip Hannah

Dear Mr. Hannah:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR JULY 2005

Enclosed is the July 2005 Discharge Monitoring Report for Sequoyah Nuclear Plant. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Stephanie A. Howard

Stephanie A. Howard
Principal Environmental Engineer
Signatory Authority for
J. Randy Douet
Site Vice President
Sequoyah Nuclear Plant

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

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

IE25

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	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	********	********	**	********	********	30.0	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	********	********	**	********	********	42.8	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	********	********	**	7.0	********	7.2	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	********	********	**	********	5	7	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	********	1577	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	********	********	**	********	0.018	0.028	19	0	32 / 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		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	05	08	10
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. CCW data for July 2005 is attached. Veliger monitoring information is attached.

CCW TRENCH

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
07/01/2005 0720	< 0.5 mg/L	07/06/2005 2317	JBR	EPA 8015B

CCW CHANNEL

Date/Time Collected	Extractable Petroleum Hydrocarbons	Analysis Date/Time	Analyst	Method
07/01/2005 0715	< 0.5 mg/L	07/06/2005 2239	JBR	EPA 8015B

Sequoyah Inplant Sampling

Sample Date	Mean # of ZM/m^3	% Settlers	Water Temp. (°C)	Sample Date	Mean# of Asiatic Clams/m^3	Water Temp. (°C)	LOCATION	SUB LOCATION	SAMPLE TYPE	COLLECTED BY
04/01/2005	0	0	14	04/01/2005	29	14	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
04/06/2005	0	0	13	04/06/2005	81	13	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
04/08/2005	0	0	14	04/08/2005	54	14	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
04/13/2005	0	0	16	04/13/2005	106	16	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
04/15/2005	0	0	16	04/15/2005	0	16	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
06/23/2005	432	50	25	06/23/2005	154	25	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
06/24/2005	162	80	25	06/24/2005	30	25	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
06/29/2005	290	80	26	06/29/2005	168	26	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/01/2005	318	100	27	07/01/2005	127	27	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/06/2005	0	0	26	07/06/2005	677	26	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/08/2005	122	29	26	07/08/2005	1132	26	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/13/2005	51	33	26	07/13/2005	998	26	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/15/2005	0	0	26	07/15/2005	186	26	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/20/2005	38	50	26	07/20/2005	303	26	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/22/2005	0	0	27	07/22/2005	100	27	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/27/2005	143	100	27	07/27/2005	341	27	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/28/2005	488	100	27	07/28/2005	627	27	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
07/29/2005	90	20	27	07/29/2005	663	27	INPLANT	Inplant Raw Water	QUANT	Dick Adcock
08/03/2005	0	0	27	08/03/2005	500	27	INPLANT	Inplant Raw Water	QUANT	Dick Adcock

quoyah Forebay Sampling

mple Date	Mean # of ZM/m^3	% Settlers	Water Temp. (°C)	Sample Date	Mean# of Asiatic Clams/m^3	Water Temp. (°C)	NOTES: % Gravid Asiatic Clam	LOCATION	SUB LOCATION	SAMPLE TYPE	COLLECTED BY
/16/2005	0	0	7.9	02/16/2005	0	7.9	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Justice
/23/2005	0	0	8	02/23/2005	0	8	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Justice
/28/2005	0	0	7	02/28/2005	54	7	0	Outside Plant	Forebay	Quant	S Jones-Brier, Chris Coe
/07/2005	0	0	7	03/07/2005	82	7	0	Outside Plant	Forebay	Quant	S Jones-Brier, Chris Coe
/15/2005	0	0	10	03/15/2005	122	10	0	Outside Plant	Forebay	Quant	S Jones-Brier, Chris Coe
/21/2005	0	0	10	03/21/2005	105	10	0	Outside Plant	Forebay	Quant	S Jones-Brier, Chris Coe
/29/2005	0	0	12	03/29/2005	101	12	0	Outside Plant	Forebay	Quant	S Jones-Brier, Chris Coe,JRigsby
/05/2005	0	0	13	04/05/2005	525	13	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/07/2005	0	0	14	04/07/2005	252	14	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/04/2005	0	0	17	05/04/2005	0	17	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/09/2005	0	0	18	05/09/2005	632	18	60%	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/12/2005	0	0	18	05/12/2005	549	18	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/17/2005	43	50	23	05/17/2005	106	23	0	Outside Plant	Forebay	Quant	J Rigsby, M MacCarroll
/19/2005	31	50	21	05/19/2005	299	21	33%	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby, MacCarroll
/23/2005	579	50	20	05/23/2005	22	20	0%	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/26/2005	242	50	20	05/26/2005	61	20	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby, MacCarroll
/30/2005	1530	26	22	05/30/2005	1831	22	66%	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/02/2005	1344	30	22	06/02/2005	1989	22	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/07/2005	240	40	23	06/07/2005	613	23	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/09/2005	192	40	24	06/09/2005	425	24	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby, MacCarroll, Shaffer
/13/2005	236	42	24	06/13/2005	928	24	0	Outside Plant	Forebay	Quant	J Rigsby, M MacCarroll
/15/2005	78	33	24.5	06/15/2005	2491	24.5	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
/23/2005	0	0	24	06/23/2005	171	24	0	Outside Plant	Forebay	Quant	W. Allen
/24/2005	0	0	24	06/24/2005	784	24	0	Outside Plant	Forebay	Quant	W. Allen
/27/2005	0	0	24	06/27/2005	305	24	0	Outside Plant	Forebay	Quant	W. Allen
/30/2005	0	0	24	06/30/2005	0	24	0	Outside Plant	Forebay	Quant	W. Allen
7/25/2005	24	100	27	07/25/2005	1205	27	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby
7/28/2005	0	0	27	07/28/2005	0	27	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby, M Wallus, G Shaffer, M M
8/01/2005	28	100	28	08/01/2005	1505	28	0	Outside Plant	Forebay	Quant	S Jones-Brier, J Rigsby

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	********	**	********	********	0.2	62	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	2.0	DEG C /HR		CONTIN UOUS	CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	1.8	04	0	31 / 31	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0	DEG. C.		CONTIN UOUS	CALCTD
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**	<0.20	<0.20	<0.20	19	0	1 / 31	GRAB
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	REPORT	REPORT	REPORT	MG/L		ONCE/ MONTH	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	05	08	10
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)*

The following injections occured: 1. PCL-222 Copolymer (max. calc. conc. was 0.019mg/L--limit 0.2mg/L) 2. PCL-222 Phosphate (max. calc. conc. was 0.054mg/L--limit 0.2mg/L) 3. Biodetergent 73551 (max. calc. conc. was 0.014mg/L--limit 2.0mg/L) 4. H-150M (max. calc. conc. was 0.0369mg/L--limit 0.050mg/L) 5. H-150M (low detection level analytical method was <0.020mg/L--limit 0.050mg/L)

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

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Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

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

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	31

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

PARAMETER		QUANTITY OR LOADING 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
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100	********	********	23	0	1 / 0	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MINIMUM	********	********	PERCENT		QTRLY	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100	********	********	23	0	1 / 0	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	43.9 MIMINUM	********	********	PERCENT		QTRLY	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	05	08	10
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 July 17-22, 2005. Report is attached.

August 9, 2005

Ruth Ann Hurt, SB 2A-SQN

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

Attached are two copies of the subject report for submission to the state of Tennessee and a copy of the report for your records. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101 samples collected July 17-22, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

In addition to the routine compliance test, fathead minnows were also tested in Outfall 101 and intake samples which were treated using UV exposure for pathogen removal prior to introduction of test organisms. Fish pathogens present in intake water have been the suspected cause of anomalous dose responses and high variability among replicates in previous toxicity testing at Sequoyah. At the time this study was conducted, mortality was not demonstrated in minnows exposed to routine compliance samples. Reduction in growth was statistically significant in UV-treated intake samples.

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

Cynthia L Russell

Cynthia L. Russell
Biologist
Environmental Engineering Services- West
CTR 2L-M

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

SQN July 2005M

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: August 9, 2005

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 3,266
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 2,992.4
8. Outfall Tested: 101
9. Dates Sampled: July 17-22, 2005
10. Average Flow on Days Sampled (MGD): 1566, 1570, 1569
11. Pertinent Site Conditions: H-130M molluscicide was injected from July 17-22, 2005. The dates and times for the H-130M injection are in the following table. See Appendix B for complete additional chemical application information during the sample collection period.

Injection Location	Date/Start Time (ET)	Date/Ending Time (ET)
Essential Raw Cooling Water (ERCW) Train A	07/18/05 @ 0930	07/20/05 @ 1035

12. Test Dates: July 19-26, 2005
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0
    Intake: 100.0
    Pimephales promelas: UV treated Outfall 101: 10.98, 22.0, 43.9, 72.0, 100.0
    UV treated Intake: 100.0
16. Permit Limit Endpoint (%): Outfall 101: $IC_{25} > 43.9\%$

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

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

18. Facility Contact: Stephanie Howard Phone #: (423) 843-6713

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

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

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

22. Notes: Outfall 101 samples collected July 17-22, 2005, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM/DD/YY)/ Time (EST) Collected	Date (MM/DD/YY)/ Time (EST) Received	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date (MM/DD/YY)/ Time (EST) Used By
101	07/17/05 0757 to 07/18/05 0657	07/18/05 1342	2.6, 2.5†	<0.10	07/19/05 1313 07/20/05 1252
Intake	07/17/05 0736 to 07/18/05 0636	07/18/05 1342	2.9	<0.10	07/19/05 1313 07/20/05 1252
101	07/19/05 0814 to 07/20/05 0714	07/20/05 1320	2.3, 2.0†	<0.10	07/21/05 1305 07/22/05 1245
Intake	07/19/05 0756 to 07/20/05 0656	07/20/05 1320	1.7	<0.10	07/21/05 1305 07/22/05 1245
101	07/21/05 0737 to 07/22/05 0637	07/22/05 1315	2.3, 2.7†	<0.10	07/23/05 1305 07/24/05 1242 07/25/05 1229
Intake	07/21/05 0722 to 07/22/05 0622	07/22/05 1315	2.8	<0.10	07/23/05 1305 07/24/05 1242 07/25/05 1229

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

4. Sample Manipulation: Samples from Outfall 101 and intake were warmed to test temperature (25.0 ± 1.0°C) in a warm water bath.

   Aliquots of Outfall 101 and Intake samples were UV-treated through a 40-watt Smart® UV Sterilizer (manufactured by Emperor Aquatics, Inc.) for 2 minutes.

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatic BioSystems, Inc.	In-house Cultures
2. Age:	22.25-23.75 hours old	<24-hours old
Test Method Summary:		
1. Test Conditions:	Static, Renewal	Static, Renewal
2. Test Duration:	7 days	Until at least 60% of control females have 3 broods
3. Control / Dilution Water:	Moderately Hard Synthetic	Moderately Hard Synthetic
4. Number of Replicates:	4	10
5. Organisms per Replicate:	10	1
6. Test Initiation: (Date/Time)		
Outfall 101	07/19/05 - 1313 ET	07/19/05 - 1200 ET
UV Treated Outfall 101	07/19/05 - 1300 ET	
7. Test Termination: (Date/Time)		
Outfall 101	07/26/05 - 1246 ET	07/26/05 - 1117 ET
UV Treated Outfall 101	07/26/05 - 1233 ET	
8. Test Temperature: Outfall 101:	Mean = 24.7C (24.1-25.3°C)	Mean = 25.0°C (24.5-25.5°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.7°C (24.1-25.3°C)	

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

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted July 19-26, 2005 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	98	98	93	93

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.696	0.716	0.613	0.698	0.681
10.98%	0.701	0.729	0.679	0.746	0.714
22.0%	0.675	0.698	0.703	0.642	0.680
43.9%	0.678	0.655	0.665	0.625	0.656
72.0%	0.713	0.792	0.726	0.753	0.746
100.0%	0.751	0.653	0.677	0.699	0.695
Intake	0.704	0.660	0.514	0.715	0.648

IC_{25} Value: ≥ 100% Permit Limit: 43.9% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: < 1.0 TUc* Permit Limit: 2.3 TUc

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

2. Results of a *Ceriodaphnia dubia* Chronic/ 7-day Toxicity Test.
(Genus species) (Type / Duration)
Conducted July 19-26, 2005 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	30	27	28	31	28	28	28	30	26	28	28.4
10.98%	32	29	27	29	32	30	33	27	33	32	30.4
22.0%	32	32	35	31	31	28	29	31	30	32	31.1
43.9%	34	35	33	35	32	34	29	35	36	32	33.5
72.0%	35	33	32	37	31	33	33	31	36	30	33.1
100.0%	33	34	34	32	33	31	34	34	37	34	33.6

IC_{25} Value: ≥ 100% Permit Limit: 43.9% 95% Confidence Limits: Upper Limit: NA Lower Limit: NA	Calculated TU Estimates: ≤ 1.0 TUc* Permit Limit: 2.3 TUc

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted July 19-26, 2005 using water from Intake

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

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	31	31	30	29	29	29	29	28	31	27	29.4
Intake	30	29	32	36	28	29	33	30	27	31	30.5

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

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

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

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

Conducted July 19-26, 2005 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
10.98%	100	100	100	100	100	100	100
22.0%	100	100	100	100	100	100	100
43.9%	100	100	100	100	100	100	100
72.0%	100	100	100	98	98	98	98
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	93

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.712	0.741	0.761	0.828	0.761
10.98%	0.798	0.798	0.700	0.686	0.746
22.0%	0.700	0.677	0.656	0.780	0.703
43.9%	0.774	0.745	0.748	0.772	0.760
72.0%	0.792	0.788	0.732	0.751	0.766
100.0%	0.720	0.688	0.731	0.921	0.765
Intake	0.596	0.706	0.722	0.654	0.670

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

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

REFERENCE TOXICANT TEST RESULTS (see Appendix A and D)

Species	Date	Time	Duration	Toxicant	Results (IC_{25})
Pimephales promelas	July 19-26, 2005	1332	7-days	KCl	0.62 g/L
Ceriodaphnia dubia	July 12-19, 2005	0845	7-days	NaCl	1.06 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Sequoyah Nuclear Plant Effluent (SQN), Outfall 101, July 19-26, 2005.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24.9 24.7 - 25.1	24.4 24.2 - 24.7	7.8 7.6 - 8.1	7.2 6.9 - 7.5	7.84 7.68 - 7.92	7.68 7.55 - 7.80	300 290 - 315	60 59 - 61	84 82 - 86	- - -
	10.98%	24.9 24.7 - 25.1	24.4 24.2 - 24.6	7.6 7.4 - 7.8	7.1 6.7 - 7.3	7.85 7.75 - 7.93	7.66 7.51 - 7.79	278 268 - 296	- - -	- - -	- - -
	22.0%	24.9 24.7 - 25.2	24.4 24.2 - 24.7	7.6 7.4 - 7.8	7.0 6.6 - 7.4	7.83 7.73 - 7.90	7.63 7.46 - 7.74	258 236 - 274	- - -	- - -	- - -
	43.9%	25.0 24.8 - 25.2	24.4 24.1 - 24.6	7.6 7.3 - 7.9	7.1 6.8 - 7.4	7.79 7.68 - 7.86	7.63 7.47 - 7.71	229 224 - 241	- - -	- - -	- - -
	72.0%	25.0 24.9 - 25.3	24.4 24.3 - 24.7	7.7 7.4 - 8.0	7.1 6.8 - 7.5	7.74 7.63 - 7.80	7.60 7.38 - 7.71	187 183 - 197	- - -	- - -	- - -
	100.0%	25.0 24.9 - 25.3	24.4 24.1 - 24.6	7.6 7.3 - 7.9	7.1 6.6 - 7.3	7.69 7.59 - 7.77	7.59 7.34 - 7.70	143 139 - 150	50 50 - 50	58 56 - 62	<0.10 <0.10 - <0.10
	Intake	24.9 24.7 - 25.2	24.4 24.3 - 24.6	7.6 7.3 - 7.9	7.2 6.9 - 7.5	7.70 7.60 - 7.80	7.61 7.39 - 7.71	144 140 - 151	52 51 - 52	63 56 - 70	<0.10 <0.10 - <0.10
Ceriodaphnia dubia	Control	24.8 24.5 - 25.2	25.0 24.8 - 25.2	7.8 7.6 - 8.1	7.6 7.4 - 7.6	7.84 7.68 - 7.92	7.85 7.78 - 7.91	300 290 - 315	60 59 - 61	84 82 - 86	- - -
	10.98%	24.9 24.6 - 25.2	24.9 24.7 - 25.3	7.6 7.4 - 7.8	7.5 7.3 - 7.8	7.85 7.75 - 7.93	7.85 7.77 - 7.91	278 268 - 296	- - -	- - -	- - -
	22.0%	24.9 24.6 - 25.1	24.9 24.7 - 25.3	7.6 7.4 - 7.8	7.7 7.4 - 8.0	7.83 7.73 - 7.90	7.84 7.76 - 7.90	258 236 - 274	- - -	- - -	- - -
	43.9%	25.0 24.6 - 25.3	24.9 24.7 - 25.2	7.6 7.3 - 7.9	7.7 7.4 - 8.1	7.79 7.68 - 7.86	7.82 7.74 - 7.89	229 224 - 241	- - -	- - -	- - -
	72.0%	25.1 24.7 - 25.3	24.9 24.8 - 25.3	7.7 7.4 - 8.0	7.6 7.4 - 8.1	7.74 7.63 - 7.80	7.80 7.72 - 7.87	187 183 - 197	- - -	- - -	- - -
	100.0%	25.1 24.8 - 25.5	24.9 24.7 - 25.3	7.6 7.3 - 7.9	7.7 7.5 - 8.1	7.69 7.59 - 7.77	7.77 7.67 - 7.83	143 139 - 150	50 50 - 50	58 56 - 62	<0.10 <0.10 - <0.10
	Intake	24.9 24.7 - 25.2	25.0 24.7 - 25.3	7.6 7.3 - 7.9	7.5 7.4 - 7.6	7.70 7.60 - 7.80	7.75 7.64 - 7.83	144 140 - 151	52 51 - 52	63 56 - 70	<0.10 <0.10 - <0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.7	24.1	25.3
Ceriodaphnia dubia	25.0	24.5	25.5

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for the *Pimephales promelas* Test, Sequoyah Nuclear Plant Effluent (SQN), UV-Treated Outfall 101, July 19-26, 2005.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)
Pimephales promelas	Control	24.9 24.8 - 25.0	24.5 24.2 - 24.7	7.7 7.5 - 7.8	7.3 6.8 - 7.6	7.84 7.75 - 7.91	7.68 7.54 - 7.79	290 276 - 311
	10.98%	24.9 24.8 - 25.1	24.3 24.1 - 24.6	7.6 7.5 - 7.8	7.1 6.7 - 7.6	7.84 7.74 - 7.91	7.65 7.53 - 7.77	278 271 - 290
	22.0%	25.0 24.7 - 25.2	24.4 24.2 - 24.6	7.7 7.5 - 7.8	7.1 6.6 - 7.6	7.83 7.72 - 7.89	7.64 7.46 - 7.75	259 237 - 275
	43.9%	25.1 24.8 - 25.2	24.4 24.2 - 24.6	7.7 7.6 - 7.8	7.0 6.4 - 7.6	7.80 7.70 - 7.88	7.60 7.43 - 7.72	236 224 - 259
	72.0%	25.1 24.8 - 25.3	24.3 24.1 - 24.5	7.6 7.4 - 7.8	7.2 6.8 - 7.6	7.77 7.66 - 7.84	7.62 7.46 - 7.71	195 185 - 228
	100.0%	25.2 24.9 - 25.3	24.3 24.1 - 24.7	7.7 7.5 - 7.9	7.1 6.7 - 7.6	7.71 7.57 - 7.80	7.57 7.41 - 7.69	149 139 - 185
	Intake	25.0 24.7 - 25.2	24.3 24.1 - 24.6	7.7 7.6 - 7.8	7.2 6.9 - 7.5	7.72 7.62 - 7.82	7.60 7.43 - 7.76	142 139 - 150

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.7	24.1	25.3

SUMMARY / CONCLUSIONS

Outfall 101 samples collected July 17-22, 2005, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

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

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1. *Pimephales promelas*

   Tests were conducted according to EPA-821-R-02-013 (October 2002) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 500-mL plastic disposable cups, each containing 250-mL of test solution.

2. *Ceriodaphnia dubia*

   Tests were conducted according to EPA-821-R-02-013 (October 2002) using ten replicates, each containing one test organism, per treatment. Test vessels consisted of 30-mL polypropylene cups, each containing 15-mL of test solution.

DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

PHYSICAL AND CHEMICAL METHODS

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

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

3. Temperature was measured by EPA Method 170.1.

4. Dissolved oxygen was measured by EPA Method 360.1.

5. The pH was measured by EPA Method 150.1.

6. Conductance was measured by EPA Method 120.1.

7. Alkalinity was measured by EPA Method 310.1.

8. Total Hardness was measured by EPA Method 130.2.

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

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage, glassware preparation, test organism culturing/acquisition and acclimation, test organism handling during test, and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA-821-R-02-013. Any known deviations were noted during the study and are reported herein.

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

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

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

3. Dilution Water Used: Moderately hard synthetic water.

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

REFERENCES

1. NPDES Permit No. TN0026450.

2. USEPA. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013 (October 2002).

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

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

Sequoyah Nuclear Plant Biomonitoring
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Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-July 22, 2005

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-July 22, 2005

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-July 22, 2005

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

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-July 22, 2005

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat
06/15/2003	-	< 0.0045	-	-	-	-	-
06/16/2003	-	< 0.0037	0.057	0.020	-	-	0.022
06/17/2003	-	< 0.0048	0.041	0.014	-	-	0.024
06/18/2003	-	< 0.0048	0.041	0.014	-	-	0.024
06/19/2003	-	< 0.0085	0.058	0.020	-	-	0.025
06/20/2003	-	< 0.0048	0.058	0.020	-	-	0.025
08/03/2003	-	<0.0050	-	-	-	-	-
08/04/2003	-	<0.0050	0.058	0.020	-	-	-
08/05/2003	-	<0.0051	0.057	0.020	-	-	0.025
08/06/2003	-	<0.0084	0.057	0.020	-	-	0.025
08/07/2003	-	0.0129	0.057	0.020	-	-	0.024
08/08/2003	-	0.0153	0.057	0.020	0.009	-	-
10/05/2003	-	<0.0043	0.057	0.020	-	-	-
10/06/2003	-	<0.0043	0.057	0.020	-	-	0.025
10/07/2003	-	<0.0090	0.057	0.020	-	-	0.025
10/08/2003	-	<0.0106	0.057	0.020	-	-	0.025
10/09/2003	-	0.0181	0.026	0.022	-	-	0.025
10/10/2003	-	0.0183	0.026	0.024	0.009	-	-
02/01/2004	-	0.0093	0.027	0.009	-	-	-
02/02/2004	-	<0.0034	0.026	0.009	-	-	-
02/03/2004	-	<0.0034	0.026	0.009	-	-	-
02/04/2004	-	0.0124	0.026	0.009	0.009	-	-
02/05/2004	-	<0.0034	0.026	0.009	-	-	-
02/06/2004	-	0.0105	0.026	0.009	0.010	-	-
05/04/2004	-	<0.0123	0.026	0.019	-	-	0.025
05/05/2004	-	<0.0144	0.026	0.014	0.009	-	0.025
05/06/2004	-	<0.0146	0.037	0.013	-	-	0.025
05/07/2004	-	0.0227	0.058	0.020	0.009	-	0.025
05/08/2004	-	0.016	0.060	0.021	-	-	-
05/09/2004	-	<0.0104	0.058	0.020	-	-	-
07/04/2004	-	0.0217	0.057	0.019	-	-	-
07/05/2004	-	<0.0085	0.057	0.020	0.009	-	-
07/06/2004	-	<0.0077	0.058	0.020	-	-	0.031
07/07/2004	-	0.0252	0.056	0.019	-	-	0.031
07/08/2004	-	0.0223	0.057	0.019	0.009	-	-
07/09/2004	-	0.0182	0.057	0.020	0.009	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998-July 22, 2005

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat
11/07/2004	-	<0.0187	0.000	0.014	-	-	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041	-	-
11/10/2004	-	<0.0149	0.047	0.016	-	-	0.041	-	-
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043	-	-
11/12/2004	-	<0.0253	0.048	0.017	-	-	0.042	-	-
02/06/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/07/2005	-	<0.0116	0.028	0.010	-	-	-	0.007	-
02/08/2005	-	<0.0080	0.028	0.010	-	-	-	-	-
02/09/2005	-	0.0199	0.028	0.010	-	-	-	-	-
02/10/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/11/2005	-	0.0155	0.028	0.010	-	-	-	0.007	-
06/05/2005	-	0.0063	-	-	-	-	-	-	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005	-	0.0103	-	-	-	-	-	-	0.037
06/08/2005	-	0.0295	-	-	-	-	-	-	0.037
06/09/2005	-	0.0129	-	-	-	-	-	-	-
06/10/2005	-	0.0184	-	-	-	-	-	-	-
07/17/2005	-	0.0109	0.026	0.009	-	-	-	-	-
07/18/2005	-	0.0150	0.026	0.009	-	-	-	-	0.036
07/19/2005	-	0.0163	0.026	0.009	-	-	-	-	0.036
07/20/2005	-	0.0209	0.026	0.009	-	-	-	0.014	0.036
07/21/2005	-	0.0242	0.026	0.009	-	-	-	-	-
07/22/2005	-	0.0238	0.054	0.018	-	-	-	0.014	-

Sequoyah Nuclear Plant Biomonitoring
July 19-26, 2005

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:
* Custody seals intact. Samples received in good condition JJumper

Field Identification / Sample Description	Grab/Comp.	Collection Date/Time		Container Number & Volume Collected	Flow MGD	Rain Event? (Mark as Appropriate)				Project #1991 Laboratory Use				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	7/17/05-7/18/05	0757/0657	2 (2.5gal)	NA			✓		050718.01	2.6/2.5°C	JJ	1342	*see
SQN-INT-TOX	Comp	7/17/05-7/18/05	0736/0636	1 (2.5 gal)	NA			✓		050718.02	2.9°C	JJ	1342	comments ↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	07/18/2005 0825	Express Courier Steve Melton 81	07/18/2005 08 25
Express Courier Steve Melton 81	07/18/2005 1342	ETS JJumper	07/18/2005 1342

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen

Environmental Testing Solution, Inc.
351 Depot Street.
Asheville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

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

General Comments:
* Custody seals intact. Samples received in good condition
J Turner

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				1991 - Pesticide # Laboratory Use				
—	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	7/19/05-7/20/05	0814/0714	2 (2.5gal)	NA			✓		050720.03	2.3/2.0	J	1320	*see comments
SQN-INT-TOX	Comp	7/19/05-7/20/05	0756/0656	1 (2.5 gal)	NA			✓		050720.04	1.7	J	1320	↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	07/20/2005 0845	Express Courier L. Q. Turner Jr.	07/20/2005 845
Express Courier L. Q. Turner Jr.	07/20/2005 1320	ETS J Turner	07/20/2005 1320

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Wanda Allen

Environmental Testing Solution, Inc.
351 Depot Street
Ashville, NC
28801
Phone: 828-350-9364
Fax: 828-350-9368

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

General Comments:
* Custody seals intact. Samples received in good condition
Jumne

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use PROJECT # 1991				
	—	Date	Time	—	—	Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time	Appearance
SQN-101-TOX	Comp	7/21/05-7/22/05	0737 / 0637	2 (2.5gal)	NA			✓		050722.01 ~~050720-031~~	2.3/2.7	d	1315	* See COMMENTS
SQN-INT-TOX	Comp	7/21/05-7/22/05	0722 / 0622	1 (2.5 gal)	NA			✓		050722.02 ~~050720-041~~	2.8	d	1315	↓

Sample Custody – Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Wanda Allen Wanda Allen	07/22/2005 0815	Express Courier	07/22/2005 0815
Express Courier	07/22/2005 1315	ETS Jumne	07/22/2005 1315

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

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 1991

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	22.25 TO 23.75 HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	07-18-05 1330 TO 1500	Incubator number:	8 3C
Organism source:	ABS BATCH 07-18-05	*Artemia* lot number:	BG180HT
Transfer bowl information:	pH = 7.59 Temperature = 24.3 °C	Total drying time:	24 HOURS
		Date / Time in:	07-26-05 1310
Average transfer volume:	10.4 ml	Date / Time out:	07-27-05 1318
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	Control water batch used MHS	Sample numbers used	Analyst
0	07-19-05	—	1530	1313	07-13-05B	050718.01402	JH
1	07-20-05	0900	1500	1252	07-13-05B	050718.01402	JH
2	07-21-05	0853	1506	1305	07-13-05B	050720.03404	JH
3	07-22-05	0905	1500	1245	07-13-05B	050720.03404	JH
4	07-23-05	0900	1514	1305	07-13-05B	050722.01402	JH
5	07-24-05	0837	1501	1242	07-13-05B JH A	050722.01402	JH
6	07-25-05	0852	1455	1229	07-13-05A JH	050722.01402	JH
7	07-26-05			1246			JH

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.681		NOEC	100%
Average weight per surviving larvae:	0.681	≥ 0.25 mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

Species: *Pimephales promelas* Date: 07-19-05

Client: TVA / Sequoyah Nuclear Plant - Non-treated

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	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 ISM
A = Pan weight (mg) BLACK Color Identification: BEAKERS Analyst: [illegible]	16.24	16.24	15.14	14.95	14.86	16.32	16.21	16.30	14.72	16.19	16.28	16.31
B = Pan + Larvae weight (mg) Analyst: KJR	23.20	23.40	21.27	21.93	21.87	23.61	23.00	23.76	21.47	23.17	23.31	22.73
Larvae weight (mg) = A – B	6.96	7.16	6.13	6.98	7.01	7.29	6.79	7.46	6.75	6.98	7.03	6.42
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.696	0.716	0.613	0.698	0.701	0.729	0.679	0.746	0.675	0.698	0.703	0.642
Average weight per initial number of larvae (mg)	0.681		[redacted]		0.714				0.680			
Percent reduction from control (%)							-4.8%				0.2%	

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

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 07-19-05

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	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	ISM 10	10	ILG 10	10	10	10	10	10	10
A = Pan weight (mg) BLACK Color identification: BREAKAS Analyst: [illegible]	16.33	14.75	16.23	15.09	15.11	16.28	14.91	14.80	16.25	15.10	14.99	16.37
B = Pan + Larvae weight (mg) Analyst: KJR	23.11	21.30	22.88	21.34	22.24	24.20	22.17	22.33	23.76	21.63	21.76	23.36
Larvae weight (mg) = A – B	6.78	6.55	6.65	6.25	7.13	7.92	7.26	7.53	7.51	6.53	6.77	6.99
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.678	0.655	0.665	0.625	0.713	0.792	0.726	0.753	0.751	0.653	0.677	0.699
Average weight per initial number of larvae (mg)	0.656				0.746				0.695			
Percent reduction from control (%)			3.7%				-9.6%				-2.1%	

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

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - Non-treated Date: 07-19-05

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	*9d	10	10
5	10	9	10	10
6	10	9	*8d	10
7	10	9	15M 8	10
A = Pan weight (mg) BLACK Color identification: BEAKERS Analyst: [illegible]	16.29	16.27	15.23	16.39
B = Pan + Larvae weight (mg) Analyst: KJR	23.33	22.87	20.37	23.54
Larvae weight (mg) = A – B	7.04	6.60	5.14	7.15
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.704	0.660	0.514	0.715
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	~~0.699~~ 0.648		~~5.6%~~ 4.8%	

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

Calculations and data reviewed: [illegible]

Comments: * DEAD ORGANISMS WERE NOT FUNGUSED. [illegible]

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
July 19-26, 2005

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

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

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
Test dates: July 19-26, 2005
Project number: 1991

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	Not for Compliance Assessment, Internal Laboratory QC: Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	16.24	23.20	6.96	0.696	0.681	6.8	0.696	100.0	0.681	6.8	Not applicable
	B	10	10	16.24	23.40	7.16	0.716			0.716				
	C	10	10	15.14	21.27	6.13	0.613			0.613				
	D	10	10	14.95	21.93	6.98	0.698			0.698				
10.98%	E	10	10	14.86	21.87	7.01	0.701	0.714	4.2	0.701	100.0	0.714	4.2	-4.8
	F	10	10	16.32	23.61	7.29	0.729			0.729				
	G	10	10	16.21	23.00	6.79	0.679			0.679				
	H	10	10	16.30	23.76	7.46	0.746			0.746				
22%	I	10	10	14.72	21.47	6.75	0.675	0.680	4.1	0.675	100.0	0.680	4.1	0.2
	J	10	10	16.19	23.17	6.98	0.698			0.698				
	K	10	10	16.28	23.31	7.03	0.703			0.703				
	L	10	10	16.31	22.73	6.42	0.642			0.642				
43.9%	M	10	10	16.33	23.11	6.78	0.678	0.656	3.4	0.678	100.0	0.656	3.4	3.7
	N	10	10	14.75	21.30	6.55	0.655			0.655				
	O	10	10	16.23	22.88	6.65	0.665			0.665				
	P	10	10	15.09	21.34	6.25	0.625			0.625				
72%	Q	10	10	15.11	22.24	7.13	0.713	0.746	4.7	0.713	100.0	0.746	4.7	-9.6
	R	10	10	16.28	24.20	7.92	0.792			0.792				
	S	10	10	14.91	22.17	7.26	0.726			0.726				
	T	10	10	14.80	22.33	7.53	0.753			0.753				
100%	U	10	10	16.25	23.76	7.51	0.751	0.695	6.0	0.751	100.0	0.695	6.0	-2.1
	V	10	10	15.10	21.63	6.53	0.653			0.653				
	W	10	10	14.99	21.76	6.77	0.677			0.677				
	X	10	10	16.37	23.36	6.99	0.699			0.699				
100% Intake	Y	10	10	16.29	23.33	7.04	0.704	0.699	5.6	0.704	92.5	0.648	14.3	4.8
	Z	10	9	16.27	22.87	6.60	0.733			0.660				
	AA	10	8	15.23	20.37	5.14	0.643			0.514				
	BB	10	10	16.39	23.54	7.15	0.715			0.715				

Outfall 101:
Dunnett's MSD value: 0.0592
PMSD: 8.7

Intake:
Dunnett's MSD value: 0.1005
PMSD: 14.8

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 13.4% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
July 19-26, 2005

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	7/19/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.6960	0.7160	0.6130	0.6980
10.98	0.7010	0.7290	0.6790	0.7460
22	0.6750	0.6980	0.7030	0.6420
43.9	0.6780	0.6550	0.6650	0.6250
72	0.7130	0.7920	0.7260	0.7530
100	0.7510	0.6530	0.6770	0.6990

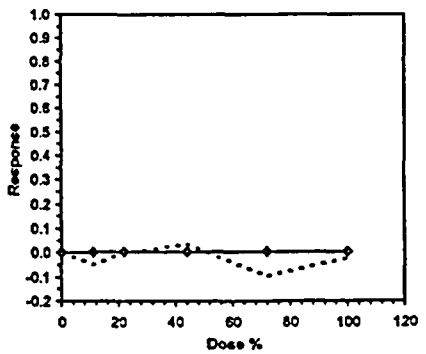
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6808	1.0000	0.6808	0.6130	0.7160	6.765	4				0.6973	1.0000
10.98	0.7138	1.0485	0.7138	0.6790	0.7460	4.158	4	-1.343	2.410	0.0592	0.6973	1.0000
22	0.6795	0.9982	0.6795	0.6420	0.7030	4.093	4	0.051	2.410	0.0592	0.6941	0.9954
43.9	0.6558	0.9633	0.6558	0.6250	0.6780	3.440	4	1.017	2.410	0.0592	0.6941	0.9954
72	0.7460	1.0959	0.7460	0.7130	0.7920	4.678	4	-2.655	2.410	0.0592	0.6941	0.9954
100	0.6950	1.0209	0.6950	0.6530	0.7510	6.013	4	-0.580	2.410	0.0592	0.6941	0.9954

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.978864908	0.884	-0.27199037	-0.4161453
Bartlett's Test indicates equal variances (p = 0.87)	1.82396853	15.08627224		

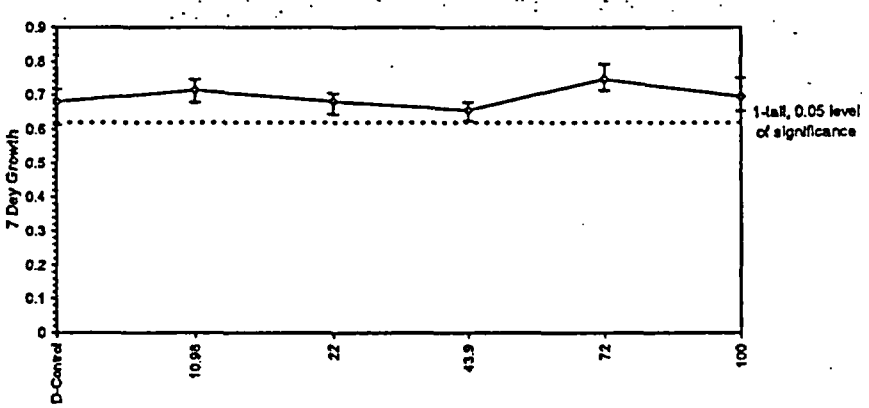
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.05923358	0.087012236	0.003949075	0.001208181	0.0283543	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_07-19-05data

TVA / Sequoyah Nuclear Plant, Intake
Non-treated
July 19-26, 2005

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	7/19/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake - Non-treated
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.6960	0.7160	0.6130	0.6980
100	0.7040	0.6600	0.5140	0.7150

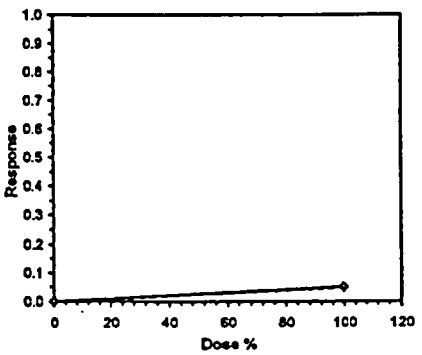
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.6808	1.0000	0.6808	0.6130	0.7160	6.765	4				0.6808	1.0000
100	0.6483	0.9523	0.6483	0.5140	0.7150	14.285	4	0.629	1.943	0.1005	0.6483	0.9523

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.847729683	0.749	-1.35377848	1.253381698
F-Test indicates equal variances (p = 0.28)	4.043024063	47.46722794		

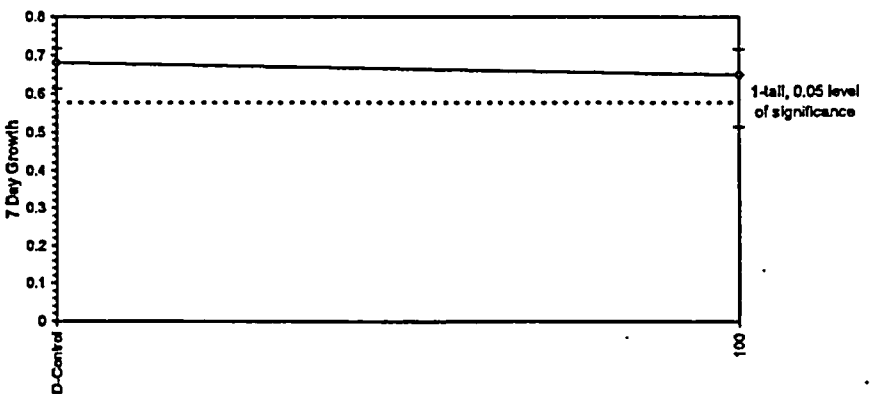
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.100482498	0.147605579	0.0021125	0.005347917	0.552833319	1, 6
Treatments vs D-Control						

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_07-19-05data

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

Client: TVA
Facility: Sequovah Nuclear Plant
NPDES #: TN 0026450
Project #: 1991

County: Hamilton
Treatment: Non-treated
Outfall: 101

Dilution preparation information:						*Comments:*
Dilution prep (%)	10.98	22	43.9	72	100	
Effluent volume (mL)	274.5	550	1097.5	1800	2500	
Diluent volume (mL)	2225.5	1950	1402.5	700	0	
Total volume (mL)	2500	2500	2500	2500	2500	

Test organism information:		*Test information:*	
Organism age:	< 24-HOURS OLD	Randomizing template:	YELLOW
Date and times organisms were born between:	07-19-05 0705 TO 1042	Incubator number and shelf location:	28243
Organism source:	07-12-05 A-H	YCT batch:	06-25-05
Transfer bowl information:	pH = 7.82 Temperature = 25.2	*Selenastrum* batch: UTEX	07-16-05

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	Control water batch used MHS	Sample numbers used	Analyst
0	07-19-05	1200	07-13-05B	050718.01402	JJ
1	07-20-05	1109	07-13-05B	050718.01402	JJ
2	07-21-05	1117	07-13-05B	050720.03404	JJ
3	07-22-05	1114	07-13-05B	050720.03404	JJ
4	07-23-05	1102	07-13-05B	050722.01402	JJ
5	07-24-05	1132	07-18-05A	050722.01402	JJ
6	07-25-05	1120	07-18-05A	050722.01402	JJ
7	07-26-05	1117	[redacted]	[redacted]	JJ

Control information:	1	2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC50	>100%
% Adults having 3rd Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	28.4	29.4	≥ 15.0 offspring/female	ChV	>100%
% CV:	5.3%	4.6%	< 40.0 %	IC25	>100%

Species: *Ceriodaphnia dubia*
Client: Sequovah Nuclear Plant - Non-treated Date: 07-19-05

CONTROL - 1 *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	4	4	3	5	4	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	9	9	10	9	10	10	11	9	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	*1	0	0	0	15	0	0	15	13	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	14	16	17	0	15	13	0	0	0
Total young produced		30	27	28	31	28	28	28	30	26	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.4

CONC: 10.98% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	4	5	4	4	4	5	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	10	10	10	11	10	9	10	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	17	0	0	14	18	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	15	13	15	0	15	19	0	0	0
Total young produced		32	29	27	29	32	30	33	27	33	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.4
% Reduction from Control:	-7.0%

Species: *Ceriodaphnia dubia*
Client: Sequovah Nuclear Plant - Non-treated Date: 07-19-05

CONC: 22% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	5	4	4	4	3	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	11	11	10	12	10	10	10	11	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	15	0	0	17	15	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	17	19	17	0	14	16	0	0	0
Total young produced		32	32	35	31	31	28	29	31	30	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.1
% Reduction from Control:	-9.5%

CONC: 43.9% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	5	6	4	4	4	4	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	12	12	10	11	13	10	12	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	*2	17	17	0	19	19	18
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	19	19	16	17	0	0	15	0	0	0
Total young produced		31	35	33	35	32	34	29	35	36	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.5
% Reduction from Control:	-18.0%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 01-19-05

CONC: 72% *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	6	4	4	4	5	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	11	12	13	12	12	11	10	13	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	18	17	19	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	19	16	16	20	15	16	0	0	0	0
Total young produced		35	33	32	37	31	33	33	31	36	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.1
% Reduction from Control:	-16.5%

CONC: 100% *Survival and Reproduction Data*

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

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.6
% Reduction from Control:	-18.3%

Species: *Ceriodaphnia dubia*
Client: Sequoyah Nuclear Plant - Non-treated Date: 07-19-05

CONTROL - 2 *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	5	4	5	4	4	5	5	5	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	10	9	9	9	10	10	10	9	9
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	16	0	14	13	17	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	16	17	15	0	15	0	0	0	0
Total young produced		31	31	30	29	29	29	29	28	31	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.4

CONC: 100% Intake *Survival and Reproduction Data*

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	4	4	4	4	4	4	3	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	10	13	9	10	13	10	10	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	15	0	1	16	0	16
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	18	19	0	15	15	0	14	0
Total young produced		30	29	32	36	28	29	33	30	27	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

% CARRY OVER

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.5
% Reduction from Control:	-3.7%

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
July 19-26, 2005

Verification of *Ceriodaphnia* Reproduction Totals

Control-1

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	3	4	4	3	5	4	4	3	38
5	9	9	9	10	9	10	10	11	9	9	95
6	1	0	0	0	15	0	0	15	13	16	60
7	16	14	16	17	0	15	13	0	0	0	91
Total	30	27	28	31	28	28	28	30	26	28	284

10.98%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	4	5	4	4	4	5	6	45
5	11	10	10	10	10	11	10	9	10	10	101
6	0	0	0	0	17	0	0	14	18	16	65
7	16	15	13	15	0	15	19	0	0	0	93
Total	32	29	27	29	32	30	33	27	33	32	304

22%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	4	4	4	3	4	4	4	40
5	12	11	11	10	12	10	10	10	11	11	108
6	0	0	0	0	15	0	0	17	15	17	64
7	16	17	19	17	0	14	16	0	0	0	99
Total	32	32	35	31	31	28	29	31	30	32	311

43.9%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	5	6	4	4	4	4	5	4	45
5	10	12	12	10	11	13	10	12	12	10	112
6	0	0	0	2	17	17	0	19	19	18	92
7	19	19	16	17	0	0	15	0	0	0	86
Total	34	35	33	35	32	34	29	35	36	32	335

72%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	6	4	4	4	5	4	4	4	4	44
5	11	11	12	13	12	12	11	10	13	10	115
6	0	0	0	0	0	0	18	17	19	16	70
7	19	16	16	20	15	16	0	0	0	0	102
Total	35	33	32	37	31	33	33	31	36	30	331

100%

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	4	4	4	6	5	5	4	45
5	12	13	10	11	11	11	13	10	12	11	114
6	0	0	0	0	0	0	0	0	20	19	39
7	17	17	19	17	18	16	15	19	0	0	138
Total	33	34	34	32	33	31	34	34	37	34	336

Control-2

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	5	4	5	4	4	5	5	5	4	46
5	10	10	9	9	9	10	10	10	9	9	95
6	0	0	0	0	16	0	14	13	17	14	74
7	16	16	17	15	0	15	0	0	0	0	79
Total	31	31	30	29	29	29	29	28	31	27	294

100% Intake

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	4	4	4	4	4	4	3	4	39
5	11	10	10	13	9	10	13	10	10	11	107
6	0	0	0	0	15	0	1	16	0	16	48
7	15	15	18	19	0	15	15	0	14	0	111
Total	30	29	32	36	28	29	33	30	27	31	305

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
July 19-26, 2005
Chronic Whole Effluent Toxicity Test (EPA-821-R-02-013, Method 1002.0)
Species: *Ceriodaphnia dubia*

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

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated

Test dates: July 19-26, 2005

Project number: 1991

Reveiwed by:

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from pooled controls (%)
	1	2	3	4	5	6	7	8	9	10				
Control - 1	30	27	28	31	28	28	28	30	26	28	100	28.4	5.3	Not applicable
10.98%	32	29	27	29	32	30	33	27	33	32	100	30.4	7.6	-7.0
22%	32	32	35	31	31	28	29	31	30	32	100	31.1	6.1	-9.5
43.9%	34	35	33	35	32	34	29	35	36	32	100	33.5	6.2	-18.0
72%	35	33	32	37	31	33	33	31	36	30	100	33.1	6.9	-16.5
100%	33	34	34	32	33	31	34	34	37	34	100	33.6	4.7	-18.3
Control - 2	31	31	30	29	29	29	29	28	31	27	100	29.4	4.6	Not applicable
100% Intake	30	29	32	36	28	29	33	30	27	31	100	30.5	8.6	-3.7

Outfall 101:
Dunnett's MSD value: 2.014
PMSD: 7.1

Intake:
Dunnett's MSD value: 1.624
PMSD: 5.5

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.2% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.
The lower and upper bounds were calculated by the USEPA using 393 tests conducted from 33 laboratories for *Ceriodaphnia* reproduction in chronic reference toxicant tests.

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

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
July 19-26, 2005

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	7/19/2005	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	30.000	27.000	28.000	31.000	28.000	28.000	28.000	30.000	26.000	28.000
10.98	32.000	29.000	27.000	29.000	32.000	30.000	33.000	27.000	33.000	32.000
22	32.000	32.000	35.000	31.000	31.000	28.000	29.000	31.000	30.000	32.000
43.9	34.000	35.000	33.000	35.000	32.000	34.000	29.000	35.000	36.000	32.000
72	35.000	33.000	32.000	37.000	31.000	33.000	33.000	31.000	36.000	30.000
100	33.000	34.000	34.000	32.000	33.000	31.000	34.000	34.000	37.000	34.000

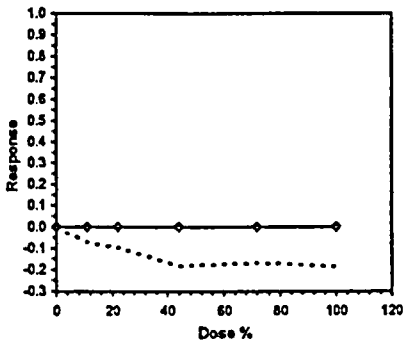
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	28.400	1.0000	28.400	26.000	31.000	5.301	10				31.683	1.0000
10.98	30.400	1.0704	30.400	27.000	33.000	7.628	10	-2.270	2.287	2.014	31.683	1.0000
22	31.100	1.0951	31.100	28.000	35.000	6.148	10	-3.065	2.287	2.014	31.683	1.0000
43.9	33.500	1.1796	33.500	29.000	36.000	6.174	10	-5.790	2.287	2.014	31.683	1.0000
72	33.100	1.1655	33.100	30.000	37.000	6.897	10	-5.336	2.287	2.014	31.683	1.0000
100	33.600	1.1831	33.600	31.000	37.000	4.695	10	-5.903	2.287	2.014	31.683	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.589113653	1.035	-0.0531424	-0.27574359
Bartlett's Test indicates equal variances (p = 0.73)	2.774007797	15.08627224		

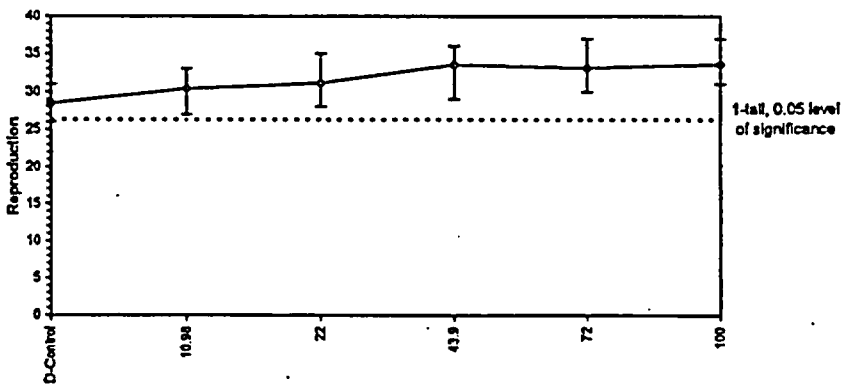
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	2.014248208	0.070924233	43.49666667	3.87962963	1.9E-07	5, 54
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_07-19-05data

TVA / Sequoyah Nuclear Plant, Intake
Non-treated
July 19-26, 2005

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	7/19/2005	Test ID:	CdFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake - Non-treated
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	31.000	31.000	30.000	29.000	29.000	29.000	29.000	28.000	31.000	27.000
100	30.000	29.000	32.000	36.000	28.000	29.000	33.000	30.000	27.000	31.000

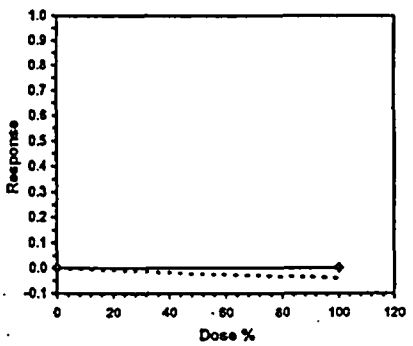
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	29.400	1.0000	29.400	27.000	31.000	4.591	10				29.950	1.0000
100	30.500	1.0374	30.500	27.000	36.000	8.640	10	-1.175	1.734	1.624	29.950	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.944049835	0.868	0.799423786	1.552869277
F-Test indicates equal variances (p = 0.06)	3.810975552	6.541089535		

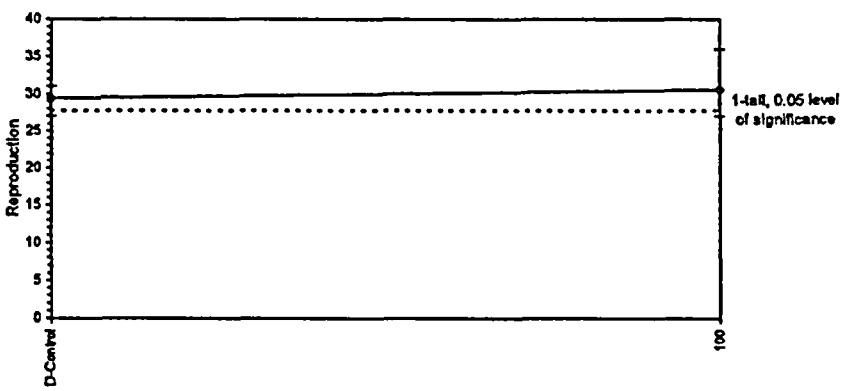
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs D-Control	1.623612085	0.055224901	6.05	4.383333333	0.255370468	1, 18

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_07-19-05data

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

Client: TVA
Facility: Sequoyah Nuclear Plant
NPDES #: TN 0026450
Project #: 1991

County: Hamilton
Treatment: UV-treated
Outfall: 101

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

Test organism information:		*Test information:*	
Organism age:	22 TO 23.5 HOURS OLD	Randomizing template:	BLUE
Date and times organisms were born between:	07-18-05 1330 TO 1500	Incubator number:	~~2~~B 3
Organism source:	ABS BATCH 07-18-05	*Artemia* lot number:	BG1804T
Transfer bowl information:	pH = 7.59 Temperature = 24.3 °C	Total drying time:	24 HOURS
		Date / Time in: 07-26-05	1310
Average transfer volume:	10.4 ml	Date / Time out: 07-27-05	1318
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Sample numbers used	Analyst
0	07-19-05	—	1530	1300	07-13-05 B	050718.01 & 02	
1	07-20-05	0900	1500	1308	07-13-05 B	050718.01 & 02	
2	07-21-05	0853	1506	1246	07-13-05 B	050720.03 & 04	
3	07-22-05	0905	1500	1231	07-13-05 B	050720.03 & 04	
4	07-23-05	0900	1514	1250	07-13-05 B	050722.01 & 02	
5	07-24-05	0837	1501	1230	07-18-05 A	050722.01 & 02	
6	07-25-05	0852	1455	1217	07-18-05 A	050722.01 & 02	
7	07-26-05			1233			

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	> 100%
Average weight per initial larvae:	0.761		NOEC	100%
Average weight per surviving larvae:	0.761	≥ 0.25 mg/larvae	LOEC	> 100%
			ChV	> 100%
			IC_{25}	> 100%

Species: *Pimephales promelas* Date: 07-19-05

Client: TVA / Sequoyah Nuclear Plant - UV-treated

Survival and Growth Data

Day	CONTROL				10.98%				22%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	ILG 10	10	10	10	ISH 10	10	ISH 10	ISH 10	10
A = Pan weight (mg) Color Identification: BROWN BEAKERS Analyst: [illegible]	14.99	16.26	14.94	16.24	15.22	14.82	14.94	15.42	14.97	15.17	16.19	15.25
B = Pan + Larvae weight (mg) Analyst: KJR	22.11	23.67	22.55	24.52	23.20	22.80	21.94	22.28	21.97	21.94	22.75	23.05
Larvae weight (mg) = A – B	7.12	7.41	7.61	8.28	7.98	7.98	7.00	6.86	7.06	6.77	6.56	7.80
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.712	0.741	0.761	0.828	0.798	0.798	0.700	0.686	0.700	0.677	0.656	0.780
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.761		[redacted]		0.746		2.0%		0.703		7.5%	

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

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 07-19-05

Survival and Growth Data

Day	43.9%				72%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	9 d	10	10	10	10
5	10	10	10	10	10	10	10	9	10	10	10	10
6	10	10	10	10	10	10	10	9	10	10	10	10
7	10	10	10	10	10	10	10	9	10	10 ISH	10	10 LG
A = Pan weight (mg) BROWN Color Identification: BEAKERS Analyst: [illegible]	15.08	14.54	14.44	15.10	14.94	15.03	16.25	15.21	14.85	15.31	14.88	14.99
B = Pan + Larvae weight (mg) Analyst: KJR	22.82	21.99	21.92	22.82	22.86	22.91	23.57	22.72	22.05	22.19	22.19	24.20
Larvae weight (mg) = A – B	7.74	7.45	7.48	7.72	7.92	7.88	7.32	7.51	7.20	6.88	7.31	* 9.21
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.774	0.745	0.748	0.772	0.792	0.788	0.732	0.751	0.720	0.688	0.731	0.921
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.760		0.1%		0.766		-0.7%		0.765		-0.6%	

* CONFIRMED

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

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas*

Client: TVA / Sequoyah Nuclear Plant - UV-treated Date: 07-19-05

Survival and Growth Data

Day	100% Intake			
	Y	Z	AA	BB
0	10	10	10	10
1	10	10	10	10
2	10	10	10	10
3	10	10	10	10
4	10	10	10	10
5	10	10	10	10
6	10	10	10	10
7	9 d	10	9 d	9 d +
A = Pan weight (mg) Color Identification: BROWN BEAKERS Analyst: [illegible]	15.22	15.14	15.20	14.86
B = Pan + Larvae weight (mg) Analyst: KJR	21.18	22.20	22.42	21.40
Larvae weight (mg) = A – B	5.96	7.06	7.22	6.54
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.596	0.706	0.722	0.654
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.670		12.0%	

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

Calculations and data reviewed: [illegible]

Comments: + ORGANISMS THAT DIED WERE NOT FUNGUSED. [illegible]

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
July 19-26, 2005

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

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

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - UV treated
Test dates: July 19-26, 2005
Project number: 1991

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	Not for Compliance Assessment, Internal Laboratory QC: Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	14.99	22.11	7.12	0.712	0.761	6.5	0.712	100.0	0.761	6.5	Not applicable
	B	10	10	16.26	23.67	7.41	0.741			0.741				
	C	10	10	14.94	22.55	7.61	0.761			0.761				
	D	10	10	16.24	24.52	8.28	0.828			0.828				
10.98%	E	10	10	15.22	23.20	7.98	0.798	0.746	8.2	0.798	100.0	0.746	8.2	2.0
	F	10	10	14.82	22.80	7.98	0.798			0.798				
	G	10	10	14.94	21.94	7.00	0.700			0.700				
	H	10	10	15.42	22.28	6.86	0.686			0.686				
22%	I	10	10	14.97	21.97	7.00	0.700	0.703	7.7	0.700	100.0	0.703	7.7	7.5
	J	10	10	15.17	21.94	6.77	0.677			0.677				
	K	10	10	16.19	22.75	6.56	0.656			0.656				
	L	10	10	15.25	23.05	7.80	0.780			0.780				
43.9%	M	10	10	15.08	22.82	7.74	0.774	0.760	2.0	0.774	100.0	0.760	2.0	0.1
	N	10	10	14.54	21.99	7.45	0.745			0.745				
	O	10	10	14.44	21.92	7.48	0.748			0.748				
	P	10	10	15.10	22.82	7.72	0.772			0.772				
72%	Q	10	10	14.94	22.86	7.92	0.792	0.787	5.3	0.792	97.5	0.766	3.8	-0.7
	R	10	10	15.03	22.91	7.88	0.788			0.788				
	S	10	10	16.25	23.57	7.32	0.732			0.732				
	T	10	9	15.21	22.72	7.51	0.834			0.751				
100%	U	10	10	14.85	22.05	7.20	0.720	0.765	13.8	0.720	100.0	0.765	13.8	-0.6
	V	10	10	15.31	22.19	6.88	0.688			0.688				
	W	10	10	14.88	22.19	7.31	0.731			0.731				
	X	10	10	14.99	24.20	9.21	0.921			0.921				
100% Intake	Y	10	9	15.22	21.18	5.96	0.662	0.724	8.1	0.596	92.5	0.670	8.5	12.0
	Z	10	10	15.14	22.20	7.06	0.706			0.706				
	AA	10	9	15.20	22.42	7.22	0.802			0.722				
	BB	10	9	14.86	21.40	6.54	0.727			0.654				

Outfall 101:
Dunnett's MSD value: 0.1016
PMSD: 13.4

Intake:
Dunnett's MSD value: 0.0732
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, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 13.4% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for *Pimephales* growth in chronic reference toxicant tests.

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

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
July 19-26, 2005

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	7/19/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.7120	0.7410	0.7610	0.8280
10.98	0.7980	0.7980	0.7000	0.6860
22	0.7000	0.6770	0.6560	0.7800
43.9	0.7740	0.7450	0.7480	0.7720
72	0.7920	0.7880	0.7320	0.7510
100	0.7200	0.6880	0.7310	0.9210

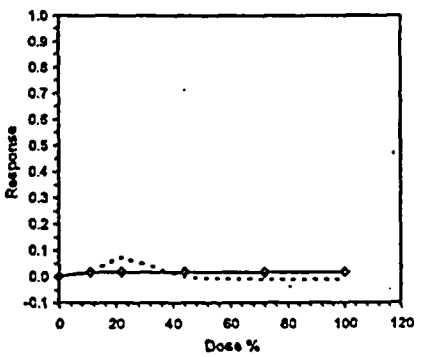
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7605	1.0000	0.7605	0.7120	0.8280	6.481	4				0.7605	1.0000
10.98	0.7455	0.9803	0.7455	0.6860	0.7980	8.168	4	0.356	2.410	0.1016	0.7479	0.9834
22	0.7033	0.9247	0.7033	0.6560	0.7800	7.711	4	1.359	2.410	0.1016	0.7479	0.9834
43.9	0.7598	0.9990	0.7598	0.7450	0.7740	2.023	4	0.018	2.410	0.1016	0.7479	0.9834
72	0.7658	1.0069	0.7658	0.7320	0.7920	3.800	4	-0.125	2.410	0.1016	0.7479	0.9834
100	0.7650	1.0059	0.7650	0.6880	0.9210	13.802	4	-0.107	2.410	0.1016	0.7479	0.9834

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.920691669	0.884	1.196228214	1.926649961
Bartlett's Test indicates equal variances (p = 0.10)	9.362391472	15.08627224		

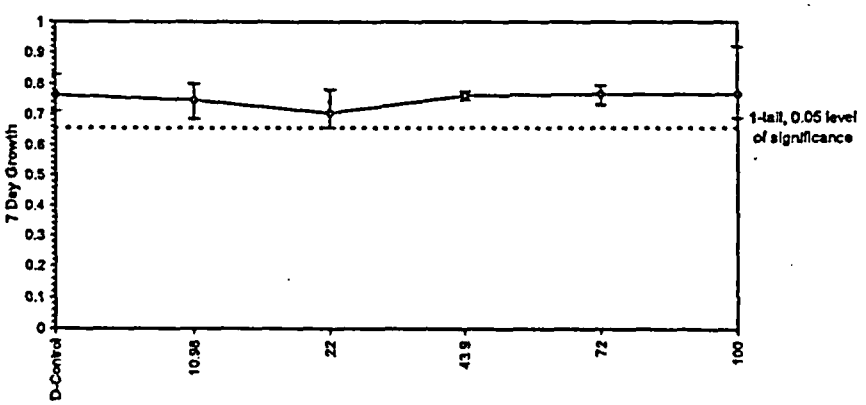
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.101559139	0.133542589	0.002307342	0.003551681	0.665465117	5, 18
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

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



Dose-Response Plot



sqn_07-19-05data

TVA / Sequoyah Nuclear Plant, Intake
UV-treated
July 19-26, 2005

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	7/19/2005	Test ID:	PpFRCR	Sample ID:	TVA / Sequoyah Nuclear Plant, Intake - UV-treated
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-%	1	2	3	4
D-Control	0.7120	0.7410	0.7610	0.8280
100	0.5960	0.7060	0.7220	0.6540

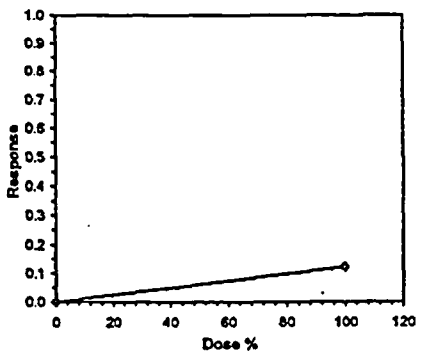
			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.7605	1.0000	0.7605	0.7120	0.8280	6.481	4				0.7605	1.0000
*100	0.6695	0.8803	0.6695	0.5960	0.7220	8.507	4	2.416	1.943	0.0732	0.6695	0.8803

Auxiliary Tests	Statistic	Critical			Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.961850226	0.749			-0.03401617	-1.12737559
F-Test indicates equal variances (p = 0.87)	1.33502543	47.46722794				
Hypothesis Test (1-tail, 0.05)	**MSDu**	**MSDp**	**MSB**	**MSE**	**F-Prob**	**df**
Homoscedastic t Test indicates significant differences Treatments vs D-Control	0.07318166	0.09622835	0.016562	0.002836667	0.052124374	1, 6

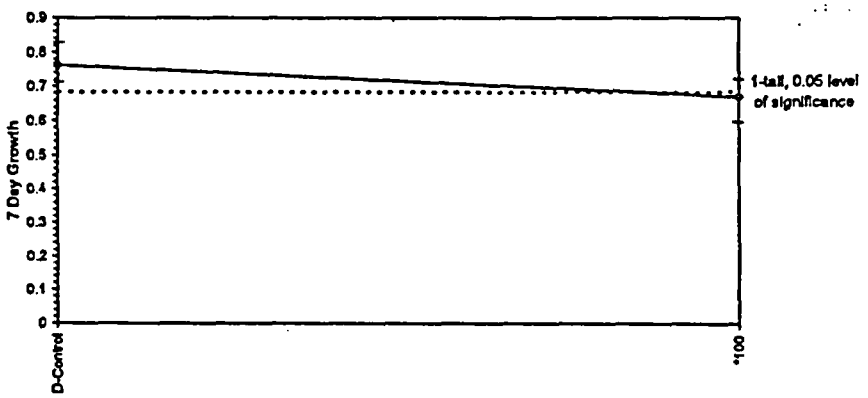
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	41.786			
IC10*	83.571			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



sqn_07-19-05data

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

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

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated

Test dates: July 19-26, 2005

Project number: 1991

Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.80	7.55	7.68	7.80	7.86	7.64	7.83	7.68	7.88	7.67	7.91	7.71	7.92	7.69
	DO (mg/L)	8.1	7.1	7.7	7.2	7.8	7.1	7.7	7.2	8.0	6.9	7.7	7.5	7.6	7.3
	Conductivity (µmhos/cm)	290		315		300		311		300		291		296	
	Alkalinity (mg/L $CaCO_3$)	61										59			
	Hardness (mg/L $CaCO_3$)	86										82			
	Temperature (°C)	25.0	24.5	24.8	24.6	24.7	24.3	24.8	24.3	24.7	24.2	24.9	24.7	25.1	24.5
10.98%	pH (SU)	7.81	7.51	7.75	7.79	7.90	7.65	7.81	7.70	7.89	7.64	7.87	7.70	7.93	7.62
	DO (mg/L)	7.7	6.9	7.6	7.2	7.5	7.1	7.7	7.3	7.8	6.7	7.5	7.3	7.4	7.0
	Conductivity (µmhos/cm)	268		287		275		296		270		273		276	
	Temperature (°C)	25.1	24.6	24.7	24.6	24.8	24.2	24.7	24.2	24.7	24.2	25.0	24.6	25.1	24.2
22%	pH (SU)	7.79	7.46	7.73	7.74	7.88	7.62	7.79	7.73	7.87	7.62	7.87	7.68	7.90	7.54
	DO (mg/L)	7.7	6.8	7.6	7.0	7.6	7.2	7.5	7.4	7.8	6.7	7.4	7.3	7.8	6.6
	Conductivity (µmhos/cm)	255		274		260		236		256		258		264	
	Temperature (°C)	25.1	24.4	24.7	24.7	24.8	24.5	24.7	24.3	24.8	24.3	25.0	24.6	25.2	24.2
43.9%	pH (SU)	7.74	7.47	7.68	7.71	7.85	7.62	7.75	7.70	7.83	7.65	7.84	7.71	7.86	7.55
	DO (mg/L)	7.8	6.9	7.6	7.0	7.6	7.2	7.4	7.3	7.9	7.0	7.3	7.4	7.7	6.8
	Conductivity (µmhos/cm)	225		241		228		232		224		226		230	
	Temperature (°C)	25.2	24.3	24.9	24.6	24.9	24.6	24.9	24.3	24.8	24.1	25.1	24.5	25.1	24.3
72%	pH (SU)	7.68	7.38	7.63	7.70	7.80	7.56	7.71	7.69	7.78	7.61	7.80	7.71	7.80	7.53
	DO (mg/L)	7.8	6.8	7.6	7.1	7.5	7.1	7.5	7.5	8.0	6.9	7.4	7.5	7.8	6.8
	Conductivity (µmhos/cm)	183		197		184		191		183		185		189	
	Temperature (°C)	25.0	24.5	24.9	24.7	24.9	24.3	24.9	24.3	24.9	24.3	25.1	24.5	25.3	24.4
100%	pH (SU)	7.62	7.34	7.59	7.70	7.77	7.57	7.65	7.66	7.74	7.60	7.75	7.67	7.70	7.62
	DO (mg/L)	7.8	6.6	7.6	7.1	7.5	7.0	7.6	7.3	7.9	6.9	7.3	7.2	7.8	7.3
	Conductivity (µmhos/cm)	143		150		143		147		139		139		143	
	Alkalinity (mg/L $CaCO_3$)	50				50				50					
	Hardness (mg/L $CaCO_3$)	56				62				56					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.3	24.5	24.9	24.4	24.9	24.4	25.0	24.1	24.9	24.3	25.1	24.6	25.2	24.3
100% Intake	pH (SU)	7.64	7.39	7.60	7.71	7.80	7.58	7.68	7.66	7.73	7.62	7.75	7.67	7.69	7.62
	DO (mg/L)	7.8	6.9	7.5	7.2	7.5	7.3	7.5	7.3	7.9	6.9	7.3	7.5	7.8	7.5
	Conductivity (µmhos/cm)	142		151		143		148		140		140		143	
	Alkalinity (mg/L $CaCO_3$)	52				52				51					
	Hardness (mg/L $CaCO_3$)	70				62				56					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	24.3	24.7	24.6	24.8	24.3	24.8	24.4	24.9	24.3	25.0	24.6	25.2	24.3

Species: *Pimephales promelas* Date: 07-19-05

Client: TVA / Sequoyah Nuclear Plant – Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	AAB	AAB	AAB	AAB	AAB	AAB
Concentration	Parameter						
CONTROL	pH (S.U.)	7.80	7.55	7.68	7.80	7.86	7.64
	DO (mg/L)	8.1	7.1	7.7	7.2	7.8	7.1
	Conductivity (µmhos/cm)	290		315		300	
	Alkalinity (mg $CaCO_3$/L)	61					
	Hardness (mg $CaCO_3$/L)	86					
	Temperature (°C)	25.0	24.5	24.8	24.6	24.7	24.3
10.98%	pH (S.U.)	7.81	7.51	7.75	7.79	7.90	7.65
	DO (mg/L)	7.7	6.9	7.6	7.2	7.5	7.1
	Conductivity (µmhos/cm)	268		287		275	
	Temperature (°C)	25.1	24.6	24.7	24.6	24.8	24.2
22%	pH (S.U.)	7.79	7.46	7.73	7.74	7.88	7.62
	DO (mg/L)	7.7	6.8	7.6	7.0	7.6	7.2
	Conductivity (µmhos/cm)	255		274		260	
	Temperature (°C)	25.1	24.4	24.7	24.7	24.8	24.5
43.9%	pH (S.U.)	7.74	7.47	7.68	7.71	7.85	7.62
	DO (mg/L)	7.8	6.9	7.6	7.0	7.6	7.2
	Conductivity (µmhos/cm)	225		241		228	
	Temperature (°C)	25.2	24.3	24.9	24.6	24.9	24.6
72%	pH (S.U.)	7.68	7.38	7.63	7.70	7.80	7.56
	DO (mg/L)	7.8	6.8	7.6	7.1	7.5	7.1
	Conductivity (µmhos/cm)	183		197		184	
	Temperature (°C)	25.0	24.5	24.9	24.7	24.9	24.3
100%	pH (S.U.)	7.62	7.34	7.59	7.70	7.77	7.57
	DO (mg/L)	7.8	6.6	7.6	7.1	7.5	7.0
	Conductivity (µmhos/cm)	143		150		143	
	Alkalinity (mg $CaCO_3$/L)	50				50	
	Hardness (mg $CaCO_3$/L)	56				62	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.3	24.5	24.9	24.4	24.4 ~~<0.10~~	24.4
100% Intake	pH (S.U.)	7.64	7.39	7.60	7.71	7.80	7.58
	DO (mg/L)	7.8	6.9	7.5	7.2	7.5	7.3
	Conductivity (µmhos/cm)	142		151		143	
	Alkalinity (mg $CaCO_3$/L)	52				52	
	Hardness (mg $CaCO_3$/L)	70				62	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.3	24.7	24.6	24.8	24.3
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 07-19-05
Client: TVA / Sequoyah Nuclear Plant – Non-treated

		Day							
		3		4		5		6	
	Analyst	AAB	KJR	KJR	KJR	KJR	AAB	AAB	AAB
Concentration	Parameter								
CONTROL	pH (S.U.)	7.83	7.68	7.88	7.67	7.91	7.71	7.92	7.69
	DO (mg/L)	7.7	7.3 6.6	8.0 7.1 KR	6.9	7.7	7.5	7.6	7.3
	Conductivity (µmhos/cm)	363		370		291		296	
	Alkalinity (mg $CaCO_3$/L)					59			
	Hardness (mg $CaCO_3$/L)					82			
	Temperature (°C)	24.8	24.3	24.7	24.2	24.9	24.7	25.1	24.5
10.98%	pH (S.U.)	7.81	7.70	7.89	7.64	7.87	7.70	7.93	7.62
	DO (mg/L)	7.7	7.3 6.7	7.8 7.2 KR	6.7	7.5	7.3	7.4	7.0
	Conductivity (µmhos/cm)	296		270		273		276	
	Temperature (°C)	24.7	24.2	24.7	24.2	25.0	24.6	25.1	24.2
22%	pH (S.U.)	7.79	7.73	7.87	7.62	7.87	7.69	7.90	7.54
	DO (mg/L)	7.5	7.4 6.9	7.8 7.2 KR	6.7	7.4	7.3	7.8	6.6
	Conductivity (µmhos/cm)	236		256		258		264	
	Temperature (°C)	24.7	24.3	24.8	24.3	25.0	24.6	25.2	24.2
43.9%	pH (S.U.)	7.75	7.70	7.83	7.65	7.84	7.71	7.86	7.55
	DO (mg/L)	7.4	7.3 6.8	7.9 7.2 KR	7.0	7.3	7.4	7.7	6.8
	Conductivity (µmhos/cm)	232		224		226		230	
	Temperature (°C)	24.9	24.3	24.8	24.1	25.1	24.5	25.1	24.3
72%	pH (S.U.)	7.71	7.69	7.78	7.61	7.80	7.71	7.80	7.53
	DO (mg/L)	7.5	7.3 6.9 KR	7.8 7.3 KR	6.9	7.4	7.5	7.8	6.8
	Conductivity (µmhos/cm)	191		183		185		189	
	Temperature (°C)	24.9	24.3	24.9	24.3	25.1	24.5	25.3	24.4
100%	pH (S.U.)	7.65	7.66	7.74	7.60	7.75	7.67	7.70	7.62
	DO (mg/L)	7.6	7.3 6.9 KR	7.9 7.2 KR	6.9	7.3	7.2	7.8	7.3
	Conductivity (µmhos/cm)	147		139		139		143	
	Alkalinity (mg $CaCO_3$/L)			50					
	Hardness (mg $CaCO_3$/L)			56					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	24.1	24.9	24.3	25.1	24.6	25.2	24.3
100% Intake	pH (S.U.)	7.68	7.66	7.73	7.62	7.75	7.67	7.69	7.62
	DO (mg/L)	7.5	7.3 6.7 KR	7.9 7.1 KR	6.9	7.3	7.5	7.8	7.5
	Conductivity (µmhos/cm)	148		140		140		143	
	Alkalinity (mg $CaCO_3$/L)			51					
	Hardness (mg $CaCO_3$/L)			56					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.4	24.9	24.3	25.0	24.6	25.2	24.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated

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

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated

Test dates: July 19-26, 2005

Project number: 1991

Reviewed by:

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.80	7.78	7.68	7.90	7.86	7.79	7.83	7.87	7.88	7.91	7.91	7.89	7.92	7.83
	DO (mg/L)	8.1	7.6	7.7	7.5	7.8	7.6	7.7	7.6	8.0	7.4	7.7	7.6	7.6	7.6
	Conductivity (µmhos/cm)	290		315		300		311		300		291		296	
	Alkalinity (mg/L $CaCO_3$)	61										59			
	Hardness (mg/L $CaCO_3$)	86										82			
	Temperature (°C)	24.7	25.1	24.8	25.2	24.6	25.0	24.7	25.1	24.5	24.8	25.1	25.0	25.2	24.8
10.98%	pH (SU)	7.81	7.77	7.75	7.90	7.90	7.79	7.81	7.86	7.89	7.91	7.87	7.88	7.93	7.84
	DO (mg/L)	7.7	7.6	7.6	7.5	7.5	7.5	7.7	7.6	7.8	7.3	7.5	7.8	7.4	7.5
	Conductivity (µmhos/cm)	268		287		275		296		270		273		276	
	Temperature (°C)	24.9	25.0	25.1	25.3	24.7	24.8	24.9	25.0	24.6	24.8	25.0	24.7	25.2	24.7
22%	pH (SU)	7.79	7.76	7.73	7.84	7.88	7.78	7.79	7.87	7.87	7.90	7.87	7.89	7.90	7.83
	DO (mg/L)	7.7	7.6	7.6	7.5	7.6	7.6	7.5	7.8	7.8	7.4	7.4	7.8	7.8	8.0
	Conductivity (µmhos/cm)	255		274		260		236		256		258		264	
	Temperature (°C)	24.9	25.0	25.1	25.3	24.7	24.8	24.9	25.1	24.6	24.8	25.0	24.9	25.1	24.7
43.9%	pH (SU)	7.74	7.74	7.68	7.81	7.85	7.77	7.75	7.85	7.83	7.89	7.84	7.88	7.86	7.82
	DO (mg/L)	7.8	7.6	7.6	7.4	7.6	7.6	7.4	7.7	7.9	7.4	7.3	7.9	7.7	8.1
	Conductivity (µmhos/cm)	225		241		228		232		224		226		230	
	Temperature (°C)	24.8	25.1	25.1	25.2	24.8	24.8	25.0	25.0	24.6	24.9	25.2	24.7	25.3	24.9
72%	pH (SU)	7.68	7.72	7.63	7.81	7.80	7.73	7.71	7.84	7.78	7.87	7.80	7.85	7.80	7.80
	DO (mg/L)	7.8	7.6	7.6	7.4	7.5	7.6	7.5	7.7	8.0	7.4	7.4	8.1	7.8	7.7
	Conductivity (µmhos/cm)	183		197		184		191		183		185		189	
	Temperature (°C)	24.9	24.8	25.3	25.3	24.9	24.8	25.2	25.0	24.7	24.9	25.2	24.8	25.2	24.8
100%	pH (SU)	7.62	7.67	7.59	7.79	7.77	7.69	7.65	7.81	7.74	7.82	7.75	7.83	7.70	7.77
	DO (mg/L)	7.8	7.6	7.6	7.5	7.5	7.6	7.6	7.9	7.9	7.5	7.3	8.1	7.8	7.7
	Conductivity (µmhos/cm)	143		150		143		147		139		139		143	
	Alkalinity (mg/L $CaCO_3$)	50				50				50					
	Hardness (mg/L $CaCO_3$)	56				62				56					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	25.1	25.5	25.3	24.9	24.9	25.2	24.8	24.8	24.7	25.1	24.8	25.2	24.8
100% Intake	pH (SU)	7.64	7.64	7.60	7.79	7.80	7.70	7.68	7.78	7.73	7.83	7.75	7.79	7.69	7.74
	DO (mg/L)	7.8	7.5	7.5	7.4	7.5	7.5	7.5	7.6	7.9	7.4	7.3	7.5	7.8	7.5
	Conductivity (µmhos/cm)	142		151		143		148		140		140		143	
	Alkalinity (mg/L $CaCO_3$)	52				52				51					
	Hardness (mg/L $CaCO_3$)	70				62				56					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	25.1	24.9	25.3	24.7	24.9	25.0	25.1	24.7	24.9	25.1	25.0	25.2	24.7

Species: *Ceriodaphnia dubia* Date: 07-19-05

Client: Sequoyah Nuclear Plant - Non-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	AAB	AAB	AAB	AAB	AAB	AAB
Concentration	Parameter						
CONTROL	pH (S.U.)	7.80	7.78	7.68	7.90	7.86	7.79
	DO (mg/L)	8.1	7.6	7.7	7.5	7.8	7.6
	Conductivity (µmhos/cm)	290		315		275 AB	
	Alkalinity (mg $CaCO_3$/L)	61					
	Hardness (mg $CaCO_3$/L)	86					
	Temperature (°C)	24.7	25.1	24.8	25.2	24.6	25.0
10.98%	pH (S.U.)	7.81	7.77	7.75	7.90	7.90	7.79
	DO (mg/L)	7.7	7.6	7.6	7.5	7.5	7.5
	Conductivity (µmhos/cm)	268		287		260	
	Temperature (°C)	24.9	25.0	25.1	25.3	24.7	24.8
22%	pH (S.U.)	7.79	7.76	7.73	7.84	7.88	7.78
	DO (mg/L)	7.7	7.6	7.6	7.5	7.6	7.6
	Conductivity (µmhos/cm)	255		274		228 AB	
	Temperature (°C)	24.9	25.0	25.1	25.3	24.7	24.8
43.9%	pH (S.U.)	7.74	7.74	7.68	7.81	7.85	7.77
	DO (mg/L)	7.8	7.6	7.6	7.4	7.6	7.6
	Conductivity (µmhos/cm)	225		241		184 AB	
	Temperature (°C)	24.8	25.1	25.1	25.2	24.8	24.8
72%	pH (S.U.)	7.68	7.72	7.63	7.81	7.80	7.73
	DO (mg/L)	7.8	7.6	7.6	7.4	7.5	7.6
	Conductivity (µmhos/cm)	183		197		141 AB	
	Temperature (°C)	24.9	24.8	25.3	25.3	24.9	24.8
100%	pH (S.U.)	7.62	7.67	7.59	7.79	7.77	7.69
	DO (mg/L)	7.8	7.6	7.6	7.5	7.5	7.6
	Conductivity (µmhos/cm)	143		150		142 AB	
	Alkalinity (mg $CaCO_3$/L)	50				50	
	Hardness (mg $CaCO_3$/L)	56				62	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	25.1	25.5	25.3	24.9	24.9
100% Intake	pH (S.U.)	7.64	7.64	7.60	7.79	7.80	7.70
	DO (mg/L)	7.8	7.7	7.5	7.4	7.5	7.5
	Conductivity (µmhos/cm)	142		151		143	
	Alkalinity (mg $CaCO_3$/L)	52				52	
	Hardness (mg $CaCO_3$/L)	70				62	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	25.1	24.9	25.3	24.7	24.9
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*
Client: Sequovah Nuclear Plant - Non-treated Date: 07-19-05

		Day							
		3		4		5		6	
	Analyst	AAB	KJR	KJR	KJR	KJR	AAB	AAB	AAB
Concentration	Parameter								
CONTROL	pH (S.U.)	7.83	7.87	7.88	7.91	7.91	7.89	7.92	7.83
	DO (mg/L)	7.7	7.6 2x	7.8 1xR	7.4	7.7	7.6	7.6	7.6
	Conductivity (µmhos/cm)	363 (300)		339 (300)		291		296	
	Alkalinity (mg $CaCO_3$/L)	(311)				59			
	Hardness (mg $CaCO_3$/L)					82			
	Temperature (°C)	24.7	25.1	24.5	24.8	25.1	25.0	25.2	24.8
10.98%	pH (S.U.)	7.81	7.86	7.89	7.91	7.87	7.88	7.93	7.84
	DO (mg/L)	7.7	7.6 2x	7.8 2xR	7.3	7.5	7.8	7.4	7.5
	Conductivity (µmhos/cm)	296		270		273		276	
	Temperature (°C)	24.9	25.0	24.6	24.8	25.0	24.7	25.2	24.7
22%	pH (S.U.)	7.79	7.87	7.87	7.90	7.87	7.87	7.90	7.83
	DO (mg/L)	7.5	7.8 2x	7.8 2xR	7.4	7.4	7.8	7.8	8.0
	Conductivity (µmhos/cm)	236		256		258		264	
	Temperature (°C)	24.9	25.1	24.6	24.8	25.0	24.9	25.1	24.7
43.9%	pH (S.U.)	7.75	7.85	7.83	7.89	7.84	7.88	7.86	7.82
	DO (mg/L)	7.4	7.8 2xR	7.8 2xR	7.4	7.3	7.9	7.7	8.1
	Conductivity (µmhos/cm)	232		224		226		230	
	Temperature (°C)	25.0	25.0	24.6	24.9	25.2	24.7	25.3	24.9
72%	pH (S.U.)	7.71	7.84	7.78	7.87	7.80	7.85	7.80	7.80
	DO (mg/L)	7.5	7.7 2x	8.0 3xR	7.4	7.4	8.1	7.8	7.7
	Conductivity (µmhos/cm)	191		183		185		189	
	Temperature (°C)	25.2	25.0	24.7	24.9	25.2	24.8	25.2	24.8
100%	pH (S.U.)	7.65	7.81	7.78	7.82	7.75	7.83	7.70	7.77
	DO (mg/L)	7.6	7.9 4xR	7.2	7.5	7.3	8.1	7.8	7.7
	Conductivity (µmhos/cm)	147		139		139		143	
	Alkalinity (mg $CaCO_3$/L)			50					
	Hardness (mg $CaCO_3$/L)			56					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.2	24.8	24.8	24.7	25.1	24.8	25.2	24.8
100% Intake	pH (S.U.)	7.68	7.78	7.73	7.83	7.75	7.79	7.69	7.74
	DO (mg/L)	7.5	7.6 Nxr	7.1	7.4	7.3	7.5	7.8	7.5
	Conductivity (µmhos/cm)	148		140		140		143	
	Alkalinity (mg $CaCO_3$/L)			51					
	Hardness (mg $CaCO_3$/L)			56					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	25.1	24.7	24.9	25.1	25.0	25.2	24.7
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated

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

Daily Chemical Analyses

Client: TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-Treated

Test dates: July 19-26, 2005

Project number: 1991

Reviewed by: [illegible]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.82	7.54	7.75	7.79	7.91	7.66	7.80	7.74	7.87	7.60	7.87	7.72	7.86	7.69
	DO (mg/L)	7.7	7.0	7.7	7.5	7.5	7.6	7.7	7.4	7.8	6.8	7.6	7.4	7.6	7.2
	Conductivity (µmhos/cm)	281		298		276		311		298		284		281	
	Temperature (°C)	24.9	24.5	24.8	24.7	24.8	24.2	24.9	24.4	24.8	24.5	24.8	24.6	25.0	24.3
10.98%	pH (SU)	7.81	7.53	7.74	7.77	7.91	7.62	7.79	7.71	7.88	7.61	7.87	7.69	7.88	7.64
	DO (mg/L)	7.8	7.0	7.7	7.6	7.5	7.1	7.6	7.3	7.7	6.7	7.5	7.1	7.7	7.0
	Conductivity (µmhos/cm)	272		290		276		281		271		278		280	
	Temperature (°C)	25.1	24.4	24.8	24.5	24.8	24.2	25.1	24.2	24.8	24.3	24.9	24.6	25.1	24.1
22%	pH (SU)	7.79	7.46	7.72	7.75	7.89	7.63	7.78	7.70	7.87	7.60	7.88	7.72	7.88	7.63
	DO (mg/L)	7.8	6.8	7.7	7.6	7.5	7.2	7.6	7.3	7.8	6.6	7.6	7.2	7.7	6.9
	Conductivity (µmhos/cm)	257		275		261		237		259		262		264	
	Temperature (°C)	25.2	24.4	24.9	24.6	24.7	24.3	25.0	24.2	24.8	24.6	25.2	24.6	25.1	24.4
43.9%	pH (SU)	7.75	7.43	7.70	7.72	7.88	7.58	7.75	7.71	7.84	7.53	7.86	7.68	7.85	7.58
	DO (mg/L)	7.8	6.7	7.6	7.6	7.6	7.3	7.7	7.3	7.7	6.4	7.6	7.3	7.7	6.7
	Conductivity (µmhos/cm)	224		242		232		259		227		231		235	
	Temperature (°C)	25.2	24.4	25.0	24.5	24.8	24.2	25.2	24.3	24.9	24.3	25.2	24.6	25.2	24.4
72%	pH (SU)	7.71	7.46	7.66	7.70	7.84	7.59	7.72	7.70	7.80	7.55	7.82	7.71	7.83	7.62
	DO (mg/L)	7.8	6.9	7.7	7.6	7.6	7.2	7.6	7.3	7.7	6.8	7.4	7.2	7.6	7.1
	Conductivity (µmhos/cm)	185		200		188		228		186		185		190	
	Temperature (°C)	25.3	24.2	25.1	24.5	24.8	24.1	25.2	24.2	24.9	24.4	25.3	24.5	25.2	24.3
100%	pH (SU)	7.64	7.41	7.57	7.65	7.80	7.54	7.66	7.69	7.75	7.53	7.76	7.67	7.77	7.53
	DO (mg/L)	7.9	6.9	7.7	7.6	7.6	7.2	7.6	7.4	7.7	6.7	7.5	7.2	7.7	6.9
	Conductivity (µmhos/cm)	144		151		143		185		141		142		139	
	Temperature (°C)	25.3	24.3	25.1	24.5	24.9	24.1	25.2	24.2	25.0	24.4	25.3	24.7	25.3	24.2
100% Intake	pH (SU)	7.69	7.43	7.62	7.66	7.82	7.57	7.66	7.70	7.75	7.59	7.77	7.76	7.75	7.50
	DO (mg/L)	7.8	7.0	7.7	7.1	7.7	7.4	7.7	7.5	7.8	6.9	7.7	7.4	7.6	6.9
	Conductivity (µmhos/cm)	144		150		141		139		139		140		142	
	Temperature (°C)	25.2	24.2	24.9	24.4	24.7	24.1	25.1	24.2	24.9	24.4	25.2	24.6	25.2	24.4

Species: *Pimephales promelas* Date: 07-19-05
Client: TVA / Sequoyah Nuclear Plant – UV-treated

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	AAB	AAB	AAB	AAB	AAB	AAB
Concentration	Parameter						
CONTROL	pH (S.U.)	7.82	7.54	7.75	7.79	7.91	7.66
	DO (mg/L)	(7.7) ~~8.1~~ AB	7.0	7.7	7.5	7.5	7.6
	Conductivity (µmhos/cm)	281		~~315~~ AB (278)		276	
	Temperature (°C)	24.9	24.5	24.8	24.7	24.8	24.2
10.98%	pH (S.U.)	7.81	7.53	7.74	7.77	7.91	7.62
	DO (mg/L)	7.8	7.0	7.7	7.6	7.5	7.1
	Conductivity (µmhos/cm)	AAB ~~236~~ (2[illegible])		~~287~~ AB (276)		276	
	Temperature (°C)	25.1	24.4	24.8	24.5	24.8	24.2
22%	pH (S.U.)	7.79	7.46	7.72	7.75	7.89	7.63
	DO (mg/L)	7.8	6.8	7.7	7.6	7.5	7.2
	Conductivity (µmhos/cm)	257		~~274~~ AB (275)		261	
	Temperature (°C)	25.2	24.4	24.9	24.6	24.7	24.3
43.9%	pH (S.U.)	7.75	7.43	7.70	7.72	7.88	7.58
	DO (mg/L)	7.8	6.7	7.6	7.6	7.6	7.3
	Conductivity (µmhos/cm)	224		~~244~~ AB (242)		232	
	Temperature (°C)	25.2	24.4	25.0	~~24~~ 24.5	24.8	24.2
72%	pH (S.U.)	7.71	7.46	7.66	7.70	7.84	7.59
	DO (mg/L)	7.8	6.9	7.7	7.6	7.6	7.2
	Conductivity (µmhos/cm)	185		~~197~~ AB (200)		188	
	Temperature (°C)	25.3	24.2	25.1	24.5	24.8	24.1
100%	pH (S.U.)	7.64	7.41	7.57	7.65	7.80	7.54
	DO (mg/L)	7.9	~~6.9~~ AB	7.7	7.6	7.6	7.2
	Conductivity (µmhos/cm)	144		~~150~~ AB (151)		143	
	Temperature (°C)	25.3	24.3	25.1	24.5	24.9	24.1
100% Intake	pH (S.U.)	7.69	7.43	7.62	7.66	7.82	7.57
	DO (mg/L)	7.8	7.0	7.7	7.1	7.7	7.4
	Conductivity (µmhos/cm)	144		~~151~~ AB (150)		141	
	Temperature (°C)	25.2	24.2	24.9	24.4	24.7	24.1
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* Date: 07-19-05
Client: TVA / Sequoyah Nuclear Plant – UV-treated

		Day							
		3		4		5		6	
	Analyst	AAB	KJR	KJR	KJR	KJR	AAB	AAB	AAB
Concentration	Parameter								
CONTROL	pH (S.U.)	7.80	7.74	7.87	7.60	7.87	7.72	7.86	7.69
	DO (mg/L)	7.7	7.3 6.9	7.8 7.2 KR	6.8	7.6	7.4	7.6	7.2
	Conductivity (µmhos/cm)	313		277		284		296	
	Temperature (°C)	24.9	24.4	24.8	24.5	24.8	24.6	25.0	24.3
10.98%	pH (S.U.)	7.79	7.71	7.88	7.61	7.87	7.69	7.88	7.64
	DO (mg/L)	7.6	7.3 6.9	7.7 7.2 KR	6.7	7.5	7.1	7.7	7.0
	Conductivity (µmhos/cm)	281		271		278		287	
	Temperature (°C)	25.1	24.2	24.8	24.3	24.9	24.6	25.1	24.1
22%	pH (S.U.)	7.78	7.70	7.87	7.60	7.88	7.72	7.88	7.63
	DO (mg/L)	7.6	7.3 6.9	7.8 7.3 KR	6.6	7.6	7.2	7.7	6.7
	Conductivity (µmhos/cm)	237		259		262		278	
	Temperature (°C)	25.0	24.2	24.8	24.6	25.2	24.6	25.1	24.4
43.9%	pH (S.U.)	7.75	7.71	7.84	7.53	7.86	7.68	7.85	7.58
	DO (mg/L)	7.7	7.3 7.0	7.7 7.3 KR	6.4	7.6	7.3	7.7	6.7
	Conductivity (µmhos/cm)	259		227		231		235	
	Temperature (°C)	25.2	24.3	24.9	24.3	25.2	24.6	25.2	24.4
72%	pH (S.U.)	7.72	7.70	7.80	7.55	7.82	7.71	7.83	7.62
	DO (mg/L)	7.6	7.3 6.9	7.7 7.2 KR	6.8	7.4	7.2	7.6	7.1
	Conductivity (µmhos/cm)	228		186		185		229	
	Temperature (°C)	25.2	24.2	24.9	24.4	25.3	24.5	25.2	24.3
100%	pH (S.U.)	7.66	7.69	7.75	7.53	7.76	7.67	7.77	7.53
	DO (mg/L)	7.6	7.4 7.1 KR	7.7 7.3 KR	6.7	7.5	7.5 AB	7.7	6.9
	Conductivity (µmhos/cm)	185		141		142		191	
	Temperature (°C)	25.2	24.2	25.0	24.4	25.3	24.7	25.3	24.2
100% Intake	pH (S.U.)	7.66	7.70	7.75	7.59	7.77	7.76	7.75	7.50
	DO (mg/L)	7.7	7.5 7.1 KR	KR 7.7 7.8	6.9	7.7	7.4	7.6	6.9
	Conductivity (µmhos/cm)	139		139		140		142	
	Temperature (°C)	25.1	24.2	24.9	24.4	25.2	24.6	25.2	24.4
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst: KEK
Date analyzed: 07-17-05

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
5.4	INR158	INR157	0.1	12.1	12.0	0.0208	10.4

Blank correction 0.0ml - 0.1ml = 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%)
INSS258	100	100	12.0	21.8	~~11.8~~ 9.8	10.4	102	102%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	21.8 Begin ml	25.0 End ml	3.2 Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
07-14-05	SSW H_2O	100	~~100~~	~~21.8~~	~~25.0~~	10.4	S 33	
↓	Duplicate	100	25.0	28.2	3.2	↓	D 33	—

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)
INSS258	50	100	25.0	33.0	8.0	10.4	83

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%)
33	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
07-13-05 A	MHS H_2O	100	33.0	39.1	6.1	10.4	63
07-13-05 B	↓		39.7	45.6	5.9		61
07-13-05 A	Salt H_2O		0.5	14.2	13.7		140
07-13-05 B	↓		14.2	28.2	14.0		150
	ABCR DMR		28.2	42.6	14.4		150
	ABAC DMR 1	(07-13-05)	0.0	14.2	14.2		150
	↓ 2	(07-13-05)	14.2	27.8	13.6		140
	MBAC DMR 1	(07-13-05)	27.9	42.0	14.1		150
	↓ 2	(07-13-05) ↓	0.1	13.8	13.7	↓	140

Reviewed by: [signature] Date reviewed: 08-02-05

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

Analyst: KJL
Date analyzed: 07-17-05

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

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

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%)
INSS858	100	100	13.8	23.6	9.8	10.4	102	102%

Duplicate sample precision:

Sample number	Sample ID 07-11-05	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%)
23858	B.R. Park	50	23.6	36.6	13.0	(2) 10.4	S 270	
↓	Duplicate	↓	0.0	12.6	12.6	(2) ↓	D 260	3.8%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS258	100	50	0.0	17.4	17.4	(2) 10.4	360

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%)
260	100	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
050712.06	C. Hatteras 1	10	17.4	22.7	5.3	(40) 10.4	550
050714.04	2		22.7	28.7	6.0		620
050716.07	3		29.0	34.4	5.4		560
050712.03	C. LeJeune 1	100	34.4	42.1	7.7		80
050714.01	2		42.1	49.9	7.8		81
050716.05	3		0.6	9.6	9.0		94
050712.04	Foxwood 1		9.6	18.3	8.7		90
050714.02	2		18.6	25.8	7.2		75
050716.06	3		25.8	36.2	10.4		110

Reviewed by: [signature] Date reviewed: 08-02-05

Alkalinity
(EPA Method 310.1)

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

Analyst	Key
Date analyzed	07-17-05

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

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

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 258	100	100	36.5	46.4	9.9	10.4	103	103%

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%)
050712.05	Robinson 1	100	0.0	0.4	0.4	10.4	S 4.2	
↓	Duplicate	↓	0.4	0.8	0.4	10.4	D 4.2	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 258	50	100	0.4	5.6	5.2	10.4	54

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%)
4.2	49.8	99.6%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
050714.03	Robinson 2	100	5.6	6.0	0.4	10.4	4.2
050716.09	↓ 3	↓	6.0	6.2	0.2	↓	2.1
050712.07	Maggie Valley 1	↓	6.2	15.3	9.1	↓	95
050714.05	↓ 2	↓	15.3	23.3	8.0	↓	83
050715.02	↓ 3	↓	23.3	30.3	~~10.0~~ 7.0	↓	~~100~~ 73
050712.02	Robbins 1	↓	30.3	36.1	5.8	↓	60
050714.06	↓ 2	↓	36.1	44.6	8.5	↓	88
050716.16	↓ 3	↓	22.6	32.6	10.0	↓	100
	PPCL DMR	↓	32.6	38.5	5.9	↓	61

Reviewed by: [signature] Date reviewed: 08-02-05

Environmental Testing Solutions, Inc.

Alkalinity
(EPA Method 310.1)

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

Analyst	KJR
Date analyzed	07.24.05

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500
4.27	INR184	INR157	0.0	12.6	12.6	0.0198	9.92 → 9.9

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 258	100	100	12.6	22.7	10.1	9.9	99.99	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%)
07.18.05	MHS B H_2O	100	22.7	28.7	6.0	9.9	S 59.4 = 59	
↓	Duplicate ↓	↓	28.7	34.7	6.0	↓	D. 59.4 = 59	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 258	50	100	28.7	39.8	11.1	9.9	109.89 → 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%)
59	51	102 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
07.18.05	MHS H_2O A	100	0.0	6.0	6.0	9.9	59
050719.01	G Town 1	100	6.0	10.8	4.8	↓	48
050721.01	G Town 2	100	10.8	15.5	4.7	↓	47
050723.01	G Town 3	100	15.5	20.2	4.7	↓	47
050718.01	SQN 1 101	100	20.2	25.2	5.0	↓	50
050720.03	SQN 2 ↓	100	25.2	30.3	5.1	↓	50
050722.01	SQN 3 ↓	100	30.3	35.3	5.0	↓	50
050718.02	SQN IN 1	100	35.3	40.6	5.3	↓	52
050720.04	SQN IN 2	100	40.6	45.9	5.3	↓	52

Reviewed by: [signature] Date reviewed: 08-02-05

Alkalinity
(EPA Method 310.1)

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

Analyst: KJR
Date analyzed: 07.24.05

Titrate samples to pH = 4.50 S.U.

Titrant normality and multiplier determination:

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

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 258	100	100	0.0	10.0	10.0	9.9	99	99 %

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = [(S - D) / [(S+D)/2]] x 100 (acceptable range = ± 10%)
050722.02	SON IN 3	100	10.0	15.2	5.2	9.9	S 51	
↓	Duplicate ↓	↓	15.2	20.3	5.1	↓	D 50	1.98 %

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 258	50	100	15.2	25.3	10.1	9.9	100

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
50	50	100 %

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
050719.02	C. Amer 1	100	25.3	31.1	5.8	9.9	57
050722.03	C Amer 2	100	31.1	38.8	7.7	↓	76
24043	BR. Parkway 07/22/05	50	38.8	50.0	11.2+ (2)	↓	260
		plus	0.8 38.4	40.2	1.8 = (13)	9.9	

13.2.55

RP

Reviewed by: d Date reviewed: 08-02-05

Environmental Testing Solutions, Inc.

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

Analyst	KLN
Date analyzed	07-17-05

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
1NR162	1NR123	0.0	9.7	9.7	0.0206	20.6

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%)
1NS5227	40	50	9.7	11.6	1.9	20.6	39	97.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
07-14-05	SSW	50	11.6	13.7	2.1	20.6	S 43	
↓	Duplicate	50	13.7	15.8	2.1	20.6	D 43	–

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)
1NS5227	40	50	13.7	17.7	4.0	20.6	82

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%)
43	39	97.5%

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	20.6	ND
07-13-05A	MHS H_2O	↓	17.7	21.7	4.0	↓	82
07-13-05B	↓	↓	21.7	25.9	4.2	↓	86
	DMRQA 25	↓	25.9	39.2	13.3	↓	273.98
	↓	25	29.2	46.0	6.8	(2) ↓	280.16
050712.04	Foxwood 1	50	0.0	5.0	5.0	↓	100
050714.02	↓ 2	↓	5.1	11.5	6.4	↓	130
050716.06	↓ 3	↓	11.5	19.2	7.7	↓	160
050712.05	Robinson 1	↓	19.2	19.9	0.7	↓	14
050714.03	↓ 2	↓	20.0	20.4	0.4	↓	8.2

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: [signature] Date reviewed 08-02-05

Environmental Testing Solutions, Inc.

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

Analyst	KEN
Date analyzed	07-17-05

Titrant normality and multiplier determination:

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

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%)
INSS827	40	50	20.4	22.5	2.1	20.6	43	107.5%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050716.09	Robinson 3	50	22.5	22.9	0.4	20.6	S 8.2	
↓	Duplicate	50	22.9	23.3	0.4	20.6	D 8.2	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS827	40	50	22.9	25.3	2.4	20.6	49

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%)
8.2	40.8	102%

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)						K
050712.07	Maggie Valley 1	50	25.3	26.5	1.2	20.6	25
050714.05	2	↓	26.5	27.7	1.2	↓	25
050715.02	3		27.7	29.2	1.5		31
050712.02	Robbins 1		29.2	31.2	2.0		41
050714.06	2		31.2	33.3	2.1		43
050716.16	3	↓	33.3	35.7	2.4	↓	49

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

Reviewed by: [signature]

Date reviewed: 08-02-05

Environmental Testing Solutions, Inc.

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

Analyst	KJR
Date analyzed	07.24.05

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.018 - 0.022)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000
INR 162	INR 123	0.0	10.0	10.0	0.02	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%)
INSS 227	40	50	10.0	12.1	2.1	20	42	105

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
	MHS A 7.18.05	50	12.1	16.2	4.1	20	S 82	
	Duplicate ↓	50	16.2	20.3	4.1	20	D 82	—

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 227	40	50	16.2	22.3	6.1	20	122

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%)
82	40	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank (should be = 0 mg $CaCO_3$/L)	50	0.0	0.0	0.0	20	ND
	MHS B 7.18.05	50	22.3	26.4	4.1	20	82
	PPCR DMR	50	26.4	30.6	4.2	20	84
050719.01	GTown 1	50	30.6	32.8	2.2	20	44
050721.01	GTown 2	50	32.8	35.0	2.2	↓	44
050723.01	GTown 3	50	35.0	37.3	2.3	↓	46
050718.01	SQN 1 101	50	37.3	40.1	2.8	↓	56
050720.03	SQN 2 ↓	50	40.1	43.2	3.1	↓	62
050722.01	SQN 3 ↓	50	0.1	2.9	2.8	↓	56
~~050720.03~~ 050718.02	SQN INT 1	50	2.9	6.4	3.5	↓	70

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

Reviewed by: [signature]

Date reviewed: 08-02-05

Total Hardness
(EPA Method 130.2)

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

Analyst	KJR
Date analyzed	07.24.05

Titrant normality and multiplier determination:

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

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 227	40	50	6.4	8.4	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%)
050720.04	SQN INT 2	50	8.4	11.5	3.1	20	S 62	
↓	Duplicate ↓	50	11.5	14.7	3.2	↓	D 64	3.2%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 227	40	50	~~14.7~~ 11.5 KR	16.7	5.2	20	104

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%)
64	40	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
	Blank ~~(should be ~ 0 mg $CaCO_3$/L)~~						KR
~~SQN IN 2~~ KR							
050722.02	SQN INT 3	50	16.7	19.5	2.8	20	56
050719.02	C. Amer 1	50	19.5	21.9	2.4	↓	48
050722.03	C. Amer 2	50	21.9	24.4	2.5		50
~~B.A. Park~~ KR						KR	
7.22.05	MHS H_2O A	50	24.4	28.5	4.1		82
7.22.05	MHS H_2O B	50	28.5	32.6 KR	4.1	↓	82
							KR

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

Reviewed by: [signature]

Date reviewed: 08-02-05

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	AAB / KEY	Iodide reagent:	INR169
Date analyzed	07-19-05	Acid reagent:	INR168

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS270	INSS270

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%)
INSS270	0.50	0.457	91.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics particles	Residual chlorine (mg/L)	%RPD = {(S - D) / [(S+D)/2]} x 100 (acceptable range = ± 10%)
050718.01	SQN 101	no color, clear	S <0.00601	
↓	Duplicate		D <0.00532	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00947
050718.02	SQN-101 - INT	no color, clear, particles	<0.00602
050719.01	ISG Georgetown	no color clear	<0.00529
	DMRQA 25		

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%)
INSS270	0.50	0.511	102.2%

Reviewed by	
Date reviewed	07-19-05

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	VEK	Iodide reagent:	IN2178
Date analyzed	07-21-05	Acid reagent:	IN2168

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	IN55270	IN55270

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%)
IN55270	0.50	0.500	100%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050720.03	TVA-SQN 101	Clear, no color, ~~any particles~~	S <0.000558	
↓	Duplicate		D <0.000545	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.000853
050720.04	TVA - SQN - INT	Clear, no color, particles	<0.000164
050721.01	ISG Georgetown	clear, no color	<0.000293

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%)
IN55270	0.50	0.504	100.8%

Reviewed by	
Date reviewed	07-22-05

Environmental Testing Solutions, Inc.

Slope = -49.3 %

Total Residual Chlorine
(EPA Method 330.5)

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

Analyst	KJR	Iodide reagent:	INR 178
Date analyzed	07.23.05	Acid reagent:	INR 168

Calibration:

	0.10 mg/L	1.00 mg/L
Reference standard number	INSS270	INSS270

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%)
INSS270	0.50	0.506	101.2 %

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
050722.01	TVA-SQN-101	tan, no particles	S 0.00174	
↓	Duplicate		D 0.00180	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Blank (should be = < 0.10 mg/L)		<0.00493
050722.02	TVA-SQN INT	tan/yllw, few particles	0.00229
050722.03	C. American-Savier	cloudy, tan, few particles	0.112
050723.02	Mt. Olive Pickle Co	tan, no particles/clear	<0.000210
050723.03	Raleigh-EM Johnson	tan, particles/~~clear~~	<0.0438
050723.01	ISG Georgetown	clear, no particles	<0.00316

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%)
INSS270	0.50	0.506	101.2 %

Reviewed by	
Date reviewed	07-23-05

Sequoyah Nuclear Plant Biomonitoring
July 19-26, 2005

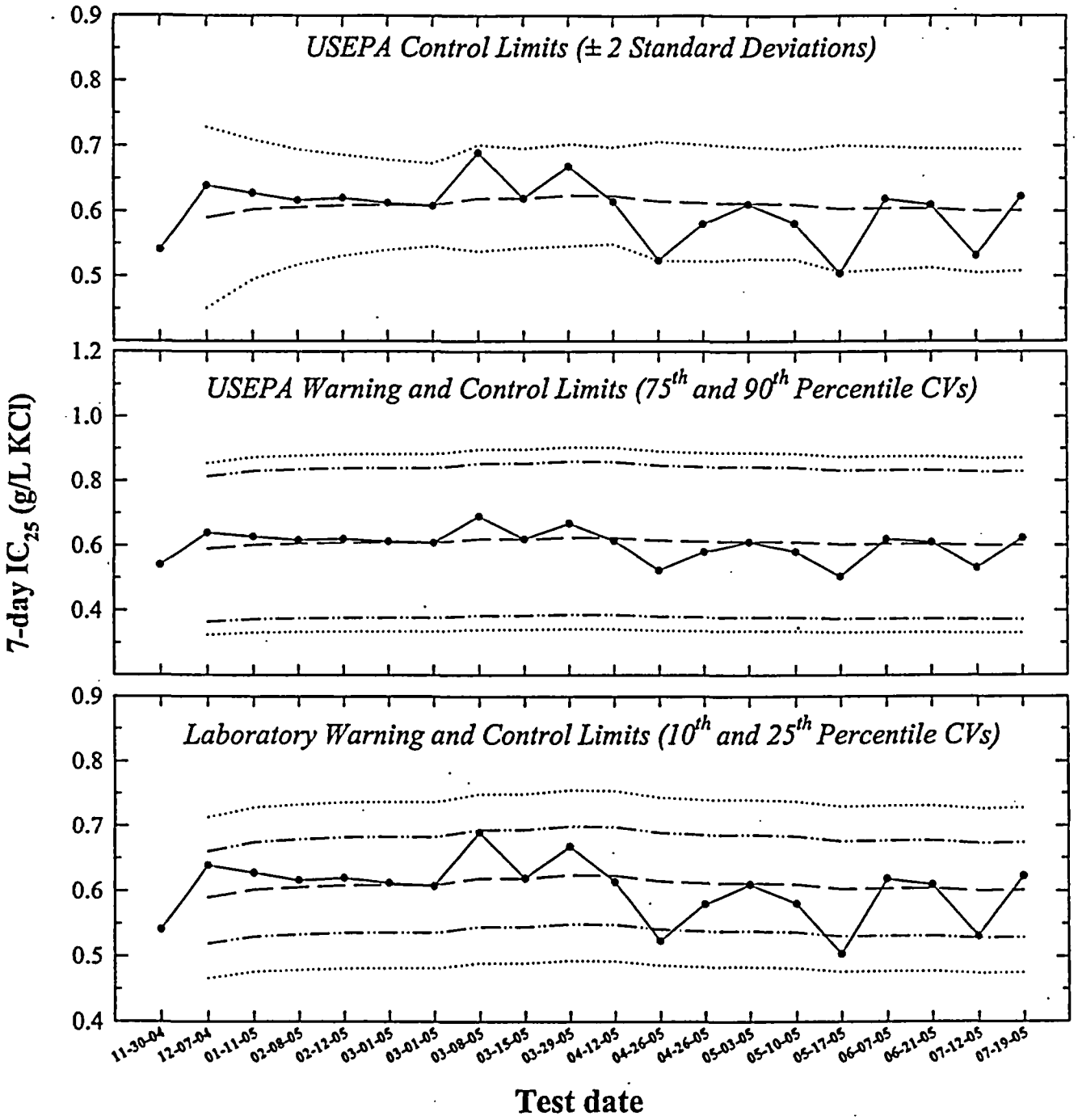
Appendix D

Reference Toxicant Test and Control Chart

Environmental Testing Solutions, Inc.

Pimephales promelas

Potassium Chloride Chronic Reference Toxicant Control Chart using Moderately Hard Synthetic Water



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

— — · **Central Tendency** (mean IC_{25})

—··—·· **Warning Limits** (mean $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

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

Environmental Testing Solutions, Inc.

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

Test number	Test date	7-day IC_{25} (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	S_{A10}	Laboratory Warning Limits $CT - S_{A10}$	$CT + S_{A10}$	S_{A25}	Laboratory Control Limits $CT - S_{A25}$	$CT + S_{A25}$	S_{A75}	USEPA Warning Limits $CT - S_{A75}$	$CT + S_{A75}$	S_{A90}	USEPA Control Limits $CT - S_{A90}$	$CT + S_{A90}$	CV
1	11-30-04	0.54																	
2	12-07-04	0.64	0.59	0.07	0.45	0.73	0.07	0.52	0.66	0.12	0.47	0.71	0.22	0.37	0.81	0.27	0.32	0.86	0.12
3	01-11-05	0.63	0.60	0.05	0.50	0.71	0.07	0.53	0.67	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.09
4	02-08-05	0.62	0.61	0.04	0.52	0.69	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.38	0.84	0.27	0.33	0.88	0.07
5	02-12-05	0.62	0.61	0.04	0.53	0.69	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.33	0.88	0.06
6	03-01-05	0.61	0.61	0.03	0.54	0.68	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.34	0.88	0.06
7	03-01-05	0.61	0.61	0.03	0.55	0.67	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.33	0.88	0.05
8	03-08-05	0.69	0.62	0.04	0.54	0.70	0.07	0.54	0.69	0.13	0.49	0.75	0.24	0.38	0.85	0.28	0.34	0.90	0.07
9	03-15-05	0.62	0.62	0.04	0.54	0.70	0.07	0.54	0.69	0.13	0.49	0.75	0.24	0.38	0.85	0.28	0.34	0.90	0.06
10	03-29-05	0.67	0.62	0.04	0.55	0.70	0.07	0.55	0.70	0.13	0.49	0.75	0.24	0.39	0.86	0.28	0.34	0.90	0.06
11	04-12-05	0.61	0.62	0.04	0.55	0.70	0.07	0.55	0.70	0.13	0.49	0.75	0.24	0.39	0.86	0.28	0.34	0.90	0.06
12	04-26-05	0.52	0.61	0.05	0.52	0.71	0.07	0.54	0.69	0.13	0.49	0.74	0.23	0.38	0.85	0.28	0.34	0.89	0.07
13	04-26-05	0.58	0.61	0.04	0.52	0.70	0.07	0.54	0.69	0.13	0.48	0.74	0.23	0.38	0.84	0.28	0.34	0.89	0.07
14	05-03-05	0.61	0.61	0.04	0.53	0.70	0.07	0.54	0.69	0.13	0.48	0.74	0.23	0.38	0.84	0.28	0.34	0.89	0.07
15	05-10-05	0.58	0.61	0.04	0.53	0.69	0.07	0.54	0.68	0.13	0.48	0.74	0.23	0.38	0.84	0.27	0.34	0.88	0.07
16	05-17-05	0.50	0.60	0.05	0.51	0.70	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.08
17	06-07-05	0.62	0.60	0.05	0.51	0.70	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.88	0.08
18	06-21-05	0.61	0.60	0.05	0.51	0.70	0.07	0.53	0.68	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.88	0.08
19	07-12-05	0.53	0.60	0.05	0.51	0.70	0.07	0.53	0.67	0.13	0.47	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.08
20	07-19-05	0.62	0.60	0.05	0.51	0.69	0.07	0.53	0.67	0.13	0.48	0.73	0.23	0.37	0.83	0.27	0.33	0.87	0.08

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

CT = Central tendency (mean IC_{25}).

S = Standard deviation of the IC_{25} values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC_{25} values corresponding to the 10th and 25th percentile CVs. These ranges are more stringent than the control and warning limits recommended by USEPA for the test method and endpoint.

S_{A10} = Standard deviation corresponding to the 10th percentile CV. (S_{A10} = 0.12)

S_{A25} = Standard deviation corresponding to the 25th percentile CV. (S_{A25} = 0.21)

USEPA Control and Warning Limits

S_{A75} = Standard deviation corresponding to the 75th percentile CV. (S_{A75} = 0.38)

S_{A90} = Standard deviation corresponding to the 90th percentile CV. (S_{A90} = 0.45)

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

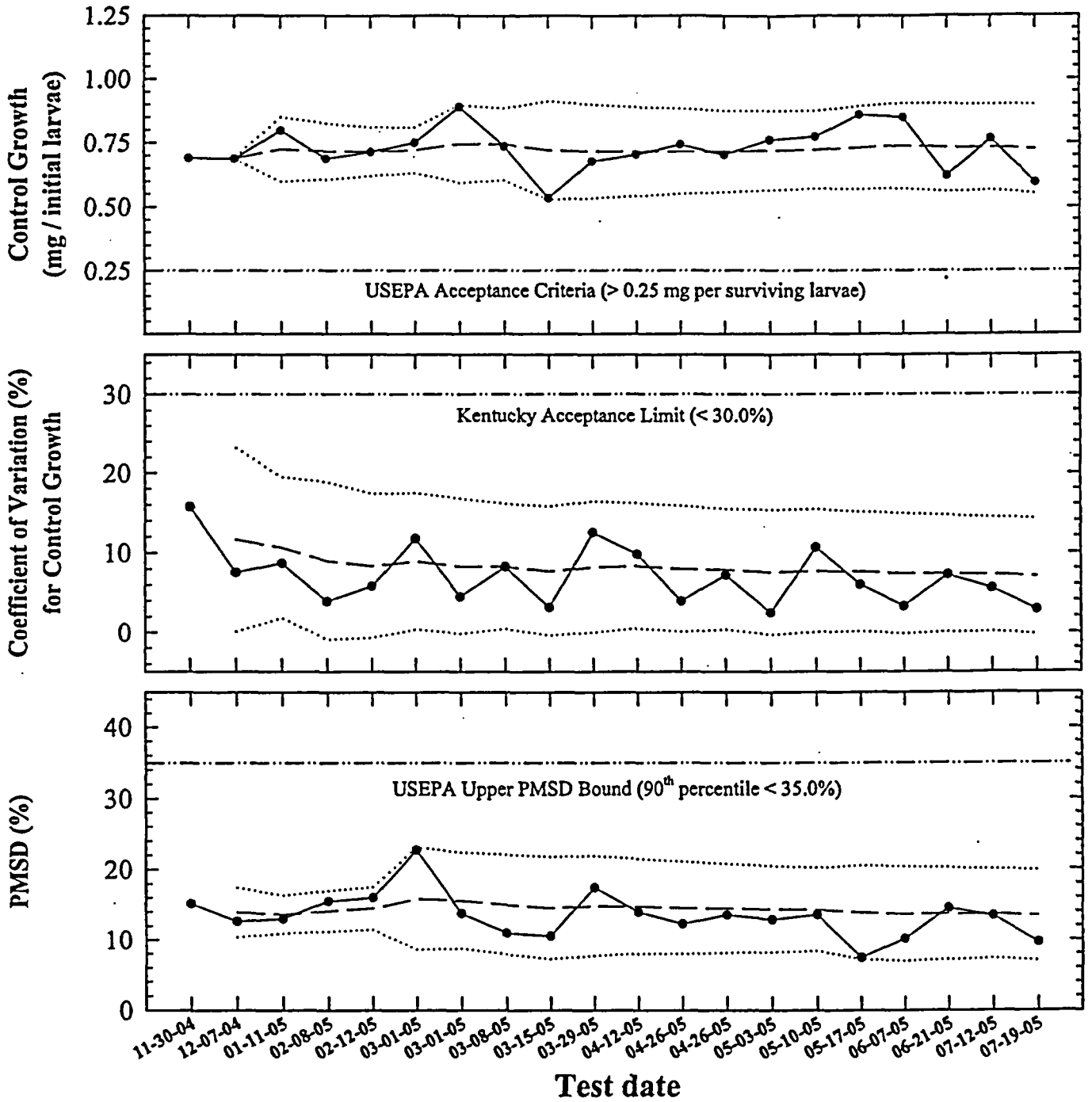
USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

Organisms obtained from Aquatic BioSystems, Inc.

07-19-05

Environmental Testing Solutions, Inc.

Pimephales promelas Control Growth, Coefficient of Variation, and PMSD in Potassium Chloride Chronic Reference Toxicant Tests



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

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

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

Environmental Testing Solutions, Inc.

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)	CT for Control Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	11-30-04	100	0.689		15.7		0.10	15.1	
2	12-07-04	97.5	0.687	0.688	7.6	11.7	0.09	12.7	13.9
3	01-11-05	100	0.797	0.724	8.7	10.7	0.10	13.0	13.6
4	02-08-05	97.5	0.687	0.715	3.9	9.0	0.11	15.5	14.1
5	02-12-05	100	0.712	0.714	5.8	8.3	0.11	16.0	14.4
6	03-01-05	100	0.749	0.720	11.8	8.9	0.17	22.7	15.8
7	03-01-05	100	0.889	0.744	4.5	8.3	0.12	13.7	15.5
8	03-08-05	100	0.735	0.743	8.3	8.3	0.08	11.0	15.0
9	03-15-05	100	0.533	0.720	3.1	7.7	0.06	10.5	14.5
10	03-29-05	100	0.676	0.715	12.5	8.2	0.12	17.4	14.8
11	04-12-05	100	0.702	0.714	9.8	8.3	0.10	13.9	14.7
12	04-26-05	100	0.742	0.716	3.9	8.0	0.09	12.3	14.5
13	04-26-05	97.5	0.702	0.715	7.2	7.9	0.10	13.5	14.4
14	05-03-05	100	0.760	0.718	2.5	7.5	0.10	12.9	14.3
15	05-10-05	100	0.772	0.722	10.7	7.7	0.10	13.5	14.3
16	05-17-05	100	0.858	0.731	6.0	7.6	0.06	7.4	13.8
17	06-07-05	100	0.848	0.737	3.3	7.4	0.09	10.1	13.6
18	06-21-05	97.5	0.622	0.731	7.2	7.4	0.09	14.5	13.7
19	07-12-05	100	0.765	0.733	5.6	7.3	0.10	13.4	13.6
20	07-19-05	100	0.596	0.726	2.9	7.0	0.06	9.7	13.4

Note:

CV = Coefficient of variation for control growth.
On average, the CV for control growth is 7.0% in Environmental Testing Solutions, Inc. *Pimephales* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 3.5%.
Upper CV bound determined by USEPA (90th percentile) = 20%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 13.4% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.

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

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.

07-19-05

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

PpKClCR Test Number: 70

Dilution preparation information:						*Comments:*
KCl CHM number:	CHM 188					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Deionized water					
Dilution prep (mg/L)	300	450	600	750	900	
Stock volume (mL)	6	9	12	15	18	
Diluent volume (mL)	994	991	988	985	982	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		*Test information:*	
Organism age:	22.5 TO 24-HOURS OLD	Randomizing template:	~~YELLOW~~ GREEN
Date and times organisms were born between:	07-18-05 1330 TO 1500	Incubator number and shelf location:	3C 3D
Organism source:	ABS BATCH 07-18-05	*Artemia* lot number:	BG-804T
Transfer bowl information:	pH = 7.59 SU. Temperature = 24.3 °C	Total drying time:	24-HOURS
		Date / Time in: 07-26-05	1310
Average transfer volume:	10.4 ml	Date / Time out: 07-27-05	1318
		Oven temperature:	60°C

Daily feeding and renewal information:

Day	Date	Morning feeding time	Afternoon feeding time	Test initiation, renewal, or termination time	MHS batch used	Analyst
0	07-19-05	—	1530	1332	07-13-05 B	JJ
1	07-20-05	0900	1500	1310	07-13-05 B	JJ
2	07-21-05	0853	1506	1322	07-13-05 B	JJ
3	07-22-05	0905	1500	1306	07-13-05 B	JJ
4	07-23-05	0900	1514	1334	07-13-05 B	JJ
5	07-24-05	0837	1501	1255	07-21-05 A	JJ
6	07-25-05	0852	1455	1240	07-21-05 A	JJ
7	07-26-05			1307		JJ

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	767.6%
Average weight per initial larvae:	0.596		NOEC	< 300
Average weight per surviving larvae:	0.596	≥ 0.25 mg/larvae	LOEC	300
			ChV	< 300
			IC_{25}	622.5

Species: *Pimephales promelas* PpKClCR Test Number: 70

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	9 d	10	10	10
4	10	10	10	10	9 d	10	10	10	9	10	10	10
5	10	10	10	10	9	10	10	10	9	10	10	10
6	10	10	10	10	9	10	10	10	9	10	10	10
7	10	10	10	10	9	10	10	10	9	10	lg 10	10
A = Pan weight (mg) Red Tray color code:: TRAY Analyst: [illegible]	15.20	15.12	16.23	15.04	14.54	15.15	14.82	15.19	15.12	16.14	14.92	14.96
B = Pan + Larvae weight (mg) Analyst: KJR	21.04	21.15	22.02	21.20	19.47	20.27	19.87	20.24	19.90	21.30	20.96	20.07
Larvae weight (mg) = A – B	5.84	6.03	5.79	6.16	4.93	5.12	5.05	5.05	4.78	5.16	6.04	5.11
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.584	0.603	0.579	0.616	0.493	0.512	0.505	0.505	0.478	0.516	0.604	0.511
Average weight per initial number of larvae (mg)	0.596				0.504				0.527			
Percent reduction from control (%)					15.4%				11.5%			

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

Calculations and data reviewed: [illegible]

Comments:

Species: *Pimephales promelas* PpKClCR Test Number: 70

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	9 1d	10	10	9 1d	9 1d	9 1d	8 2d	4 4d	5 5d	3 7d	3 7d
2	10	9	10	10	9	9	9	8	4	5	3	3
3	10	9	9 1d	10	8 1d	9	9	8	4	5	3	3
4	10	8 1d	8 1d	10	7 1d	8 1d	8 1d	8	1 3d	5	3	1 3d
5	10	7 1d	8	9 1d	6 1d	8	8	8	1	4 1d	2 1d	1
6	10	7	8	9	6	8	8	7 1d	1	4	1 1d	1
7	10	1LG 7	8	9	6	1SH 8	8	7	1	2 2d	1 SH	0 1d
A = Pan weight (mg) RED Tray color code:: TRAY Analyst: [illegible]	14.73	16.19	15.24	16.17	15.95	16.01	15.28	15.11	14.46	14.79	14.53	14.42
B = Pan + Larvae weight (mg) Analyst: KJR	19.67	20.63	19.36	21.18	19.02	19.38	19.47	18.69	14.95	15.89	14.78	—
Larvae weight (mg) = A – B	4.94	4.44	4.12	5.01	3.07	3.37	4.19	3.58	0.49	1.10	0.25	—
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.494	0.444	0.412	0.501	0.307	0.337	0.419	0.358	0.049	0.110	0.025	0
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.463		22.3%		0.355		40.3%		0.046		92.3%	

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

Calculations and data reviewed: [illegible]

Comments:

Environmental Testing Solutions, Inc.

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

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

Test number: PpKCYCR # 110 (#70 at 351 Depot St.)
Test dates: July 19-26, 2005

Reviewed by: JLumen

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	15.20	21.04	5.84	0.584	0.596	2.9	0.584	100.0	0.596	2.9	Not applicable
	B	10	10	15.12	21.15	6.03	0.603			0.603				
	C	10	10	16.23	22.02	5.79	0.579			0.579				
	D	10	10	15.04	21.20	6.16	0.616			0.616				
300	E	10	9	14.54	19.47	4.93	0.548	0.517	4.0	0.493	97.5	0.504	1.6	15.4
	F	10	10	15.15	20.27	5.12	0.512			0.512				
	G	10	10	14.82	19.87	5.05	0.505			0.505				
	H	10	10	15.19	20.24	5.05	0.505			0.505				
450	I	10	9	15.12	19.90	4.78	0.531	0.541	8.0	0.478	97.5	0.527	10.2	11.5
	J	10	10	16.14	21.30	5.16	0.516			0.516				
	K	10	10	14.92	20.96	6.04	0.604			0.604				
	L	10	10	14.96	20.07	5.11	0.511			0.511				
600	M	10	10	14.73	19.67	4.94	0.494	0.550	11.3	0.494	85.0	0.463	9.1	22.3
	N	10	7	16.19	20.63	4.44	0.634			0.444				
	O	10	8	15.24	19.36	4.12	0.515			0.412				
	P	10	9	16.17	21.18	5.01	0.557			0.501				
750	Q	10	6	15.95	19.02	3.07	0.512	0.492	9.7	0.307	72.5	0.355	13.3	40.3
	R	10	8	16.01	19.38	3.37	0.421			0.337				
	S	10	8	15.28	19.47	4.19	0.524			0.419				
	T	10	7	15.11	18.69	3.58	0.511			0.358				
900	U	10	1	14.46	14.95	0.49	0.490	0.430	36.9	0.049	10.0	0.046	102.4	92.3
	V	10	2	14.79	15.89	1.10	0.550			0.110				
	W	10	1	14.53	14.78	0.25	0.250			0.025				
	X	10	0	0.00	0.00	0.00	0.000			0.000				

Dunnett's MSD value: 0.0575
PMSD: 9.7

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, Inc. chronic toxicity tests when a toxicant reduces *Pimephales* growth by 13.4% from the control (determined through reference toxicant testing).
Lower PMSD bound determined by USEPA (10th percentile) = 9.4%.
Upper PMSD bound determined by USEPA (90th percentile) = 35%.
The lower and upper bounds were calculated by the USEPA using 205 tests conducted from 19 laboratories for Pimephales growth in chronic reference toxicant tests.

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

Organisms obtained from Aquatic BioSystems, Inc.

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	7/19/2005	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
300	0.9000	1.0000	1.0000	1.0000
450	0.9000	1.0000	1.0000	1.0000
600	1.0000	0.7000	0.8000	0.9000
750	0.6000	0.8000	0.8000	0.7000
900	0.1000	0.2000	0.1000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
300	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
450	0.9750	0.9750	1.3713	1.2490	1.4120	5.942	4	16.00	10.00	1	40
600	0.8500	0.8500	1.1898	0.9912	1.4120	15.281	4	12.00	10.00	6	40
*750	0.7250	0.7250	1.0229	0.8861	1.1071	10.396	4	10.00	10.00	11	40
*900	0.1000	0.1000	0.3165	0.1588	0.4636	39.374	4	10.00	10.00	36	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.944893658	0.884	-0.13279957	0.318892849
Equality of variance cannot be confirmed				

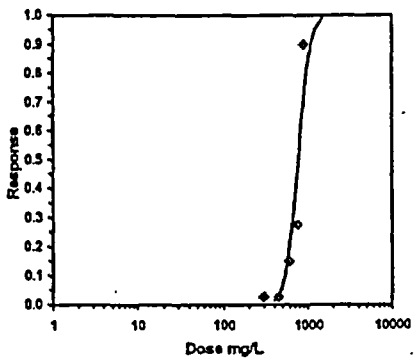
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	600	750	670.8209932	
Treatments vs D-Control				

Maximum Likelihood-Probit

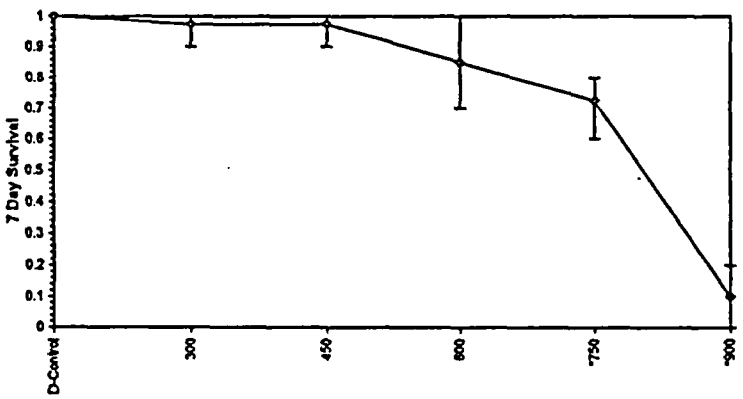
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.103164432	5.754692465	-10.210835	26.41716384	0	63.8625447	7.814727783	8.8E-14	2.88479048	0.123408578	5
Intercept	-18.3759316	16.4300109	-70.663558	33.91169481							
TSCR											

Point	Probits	mg/L	95% Fiducial Limits
EC01	2.674	396.0036561	
EC05	3.355	480.6195498	
EC10	3.718	532.8881041	
EC15	3.964	571.3282703	
EC20	4.158	603.8474035	
EC25	4.326	633.2171361	
EC40	4.747	713.7157421	
EC50	5.000	766.991378	
EC60	5.253	824.2438091	
EC75	5.674	929.0269252	
EC80	5.842	974.2126478	
EC85	6.036	1029.663367	
EC90	6.282	1103.9386	
EC95	6.645	1223.994636	
EC99	7.326	1485.531303	

Significant heterogeneity detected (p = 8.78E-14)



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

07-19-05

Environmental Testing Solutions, Inc.
Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	7/19/2005	Test ID:	PpKCICR	Sample ID:	REF-Ref Toxicant
End Date:	7/26/2005	Lab ID:	ETS-Envir. Testing Sol	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	0.5840	0.6030	0.5790	0.6160
300	0.4930	0.5120	0.5050	0.5050
450	0.4780	0.5160	0.6040	0.5110
600	0.4940	0.4440	0.4120	0.5010
750	0.3070	0.3370	0.4190	0.3580
900	0.0490	0.1100	0.0250	0.0000

			Transform: Untransformed					1-Tailed			Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.5955	1.0000	0.5955	0.5790	0.6160	2.878	4				0.5955	1.0000
*300	0.5038	0.8459	0.5038	0.4930	0.5120	1.566	4	3.653	2.290	0.0575	0.5155	0.8657
*450	0.5273	0.8854	0.5273	0.4780	0.6040	10.218	4	2.717	2.290	0.0575	0.5155	0.8657
*600	0.4628	0.7771	0.4628	0.4120	0.5010	9.140	4	5.285	2.290	0.0575	0.4628	0.7771
750	0.3553	0.5966	0.3553	0.3070	0.4190	13.335	4				0.3553	0.5966
900	0.0460	0.0772	0.0460	0.0000	0.1100	102.443	4				0.0460	0.0772

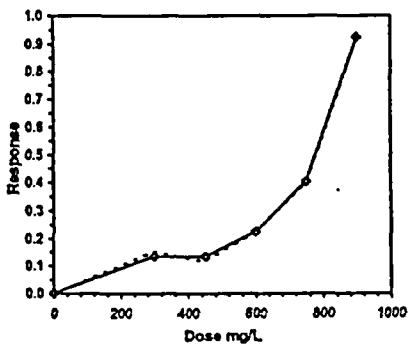
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.942534149	0.844	0.661523867	1.25944343
Bartlett's Test indicates equal variances (p = 0.03)	8.652840614	11.34486675		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<300	300			0.05751892	0.096589286	0.012364063	0.001261771	0.001507955	3, 12
Treatments vs D-Control										

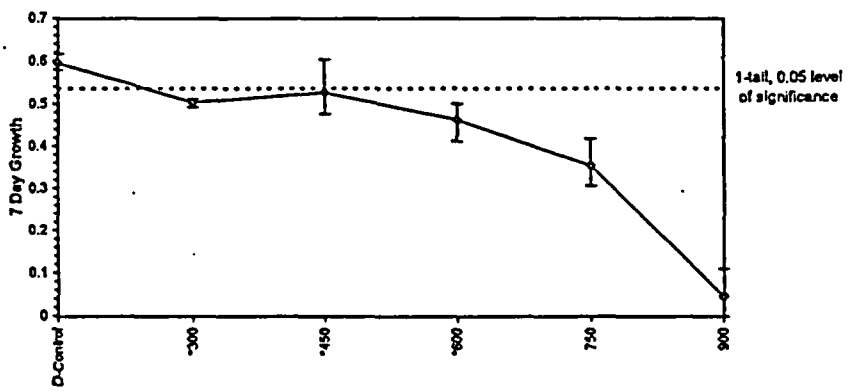
Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	111.66	32.97	71.74	219.20	5.8004
IC10*	223.31	71.41	143.47	615.57	2.3752
IC15	476.52	99.14	130.28	610.63	-0.4975
IC20	561.18	42.25	436.81	667.74	-0.4525
IC25	622.50	26.58	520.97	689.44	-0.4526
IC40	747.14	16.42	687.31	782.24	-0.4213
IC50	777.89	7.85	752.91	808.31	0.0281

* indicates IC estimate less than the lowest concentration



Dose-Response Plot



Organisms obtained from Aquatic BioSystems, Inc.

Species: *Pimephales promelas* PpKClCR Test Number: 70

Daily Chemistry:

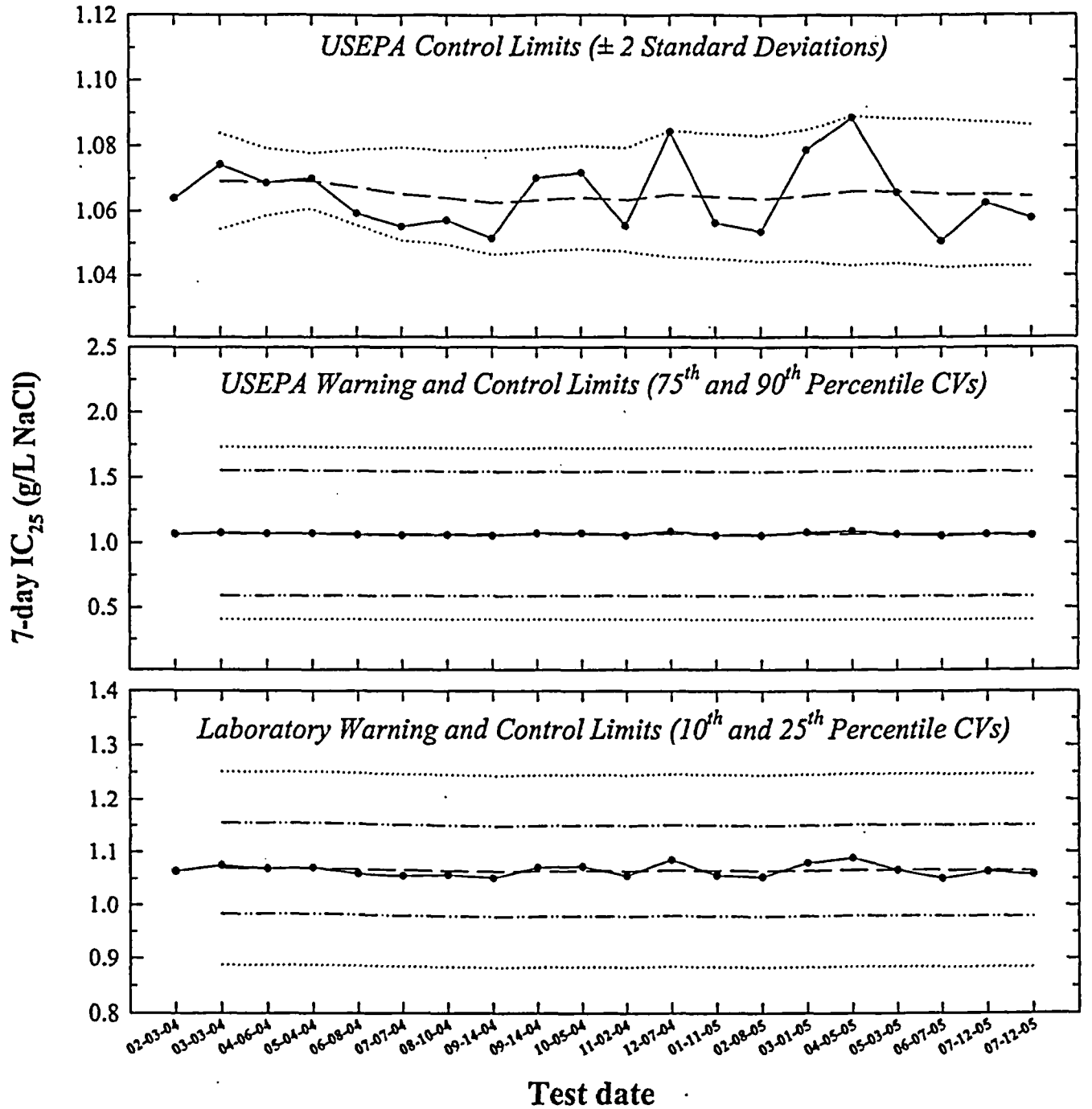
		Day 0		Day 1		Day 2	
	Analyst	AAB	AAB	AAB	AAB	AAB	AAB
Concentration	Parameter						
CONTROL	pH (S.U.)	7.80	7.56	7.68	7.77	7.86	7.65
	DO (mg/L)	8.1	7.4	7.7	7.1	7.8	~~7.3~~ AAB
	Conductivity (µmhos/cm)	290		315		300	7.3
	Alkalinity (mg $CaCO_3$/L)	61					
	Hardness (mg $CaCO_3$/L)	86		H		AB	
	Temperature (°C)	24.6	24.5	24.8	24.7	24.6	24.3
300 mg KCl/L	pH (S.U.)	7.83	7.60	7.72	7.78	7.88	7.66
	DO (mg/L) AB	~~8.7~~ 7.2	~~7.0~~ 7.2	7.6	7.2	7.7	~~7.6~~ AAB
	Conductivity (µmhos/cm)	772		842		787	7.2
	Temperature (°C)	24.8	24.2	24.9	24.6	24.6	24.4
450 mg KCl/L	pH (S.U.)	7.83	7.56	7.74	7.78	7.91	7.69
	DO (mg/L) AB	~~8.9~~ 7.3	7.3	~~7.75~~ AB	7.3	7.9	~~7.7~~ AAB
	Conductivity (µmhos/cm) AB	~~1140~~ 1180		~~1150~~ AB 1150		1040	7.2
	Temperature (°C)	24.8	24.2	24.9	24.6	24.6	24.4
600 mg KCl/L	pH (S.U.)	7.83	7.58	7.74	7.78	7.92	7.67
	DO (mg/L) AB	~~8.9~~ 7.9	7.2	8.0	7.3	8.0	~~7.7~~ AAB
	Conductivity (µmhos/cm)	1330		~~1410~~ AB 1260		1260	7.3
	Temperature (°C)	24.8	24.2	25.0	24.6	24.7 ~~24.6~~ AB	24.3
750 mg KCl/L	pH (S.U.)	7.83	7.56	7.74	7.81	7.93	7.67
	DO (mg/L) AB	~~8.9~~ 7.9	7.2	8.2	7.5	7.9	~~7.8~~ AAB
	Conductivity (µmhos/cm)	1546		~~1670~~ AB 1660		1440	7.2
	Temperature (°C)	24.8	24.3	25.0	~~25~~ 24.5	24.7	24.3
900 mg KCl/L	pH (S.U.)	7.83	7.62	7.75	7.83	7.93	7.70
	DO (mg/L) AB	~~7.0~~ 8.0	7.2	8.2	7.4	8.1	~~7.8~~ AAB
	Conductivity (µmhos/cm)	1780		1760		1790	7.3
	Temperature (°C)	24.8	24.3	24.8	24.7	24.6	24.3
STOCK	Conductivity (µmhos/cm)	63200		67800			
		Initial	Final	Initial	Final	Initial	Final

Species: *Pimephales promelas* PpKClCR Test Number: 70

		Day							
		3		4		5		6	
	Analyst	AAB	KJR	KJR	KJR	KJR	AAB	AAB	AAB
Concentration	Parameter								
CONTROL	pH (S.U.)	7.83	7.69	7.88	7.65	7.91	7.77	7.92	7.76
	DO (mg/L)	7.7	7.5	8.0	7.0	7.7	7.7	7.6	7.6
	Conductivity (µmhos/cm)	323		370		291		296	
	Alkalinity (mg $CaCO_3$/L)	311				59			
	Hardness (mg $CaCO_3$/L)					82			
	Temperature (°C)	24.6	24.2	24.7	24.3	24.9	24.7	25.1	24.3
300 mg KCl/L	pH (S.U.)	7.86	7.73	7.91	7.64	7.89	7.69	7.92	7.69
	DO (mg/L)	7.6	6.7	7.8	6.8	7.7	7.4	7.6	6.9
	Conductivity (µmhos/cm)	786		791		810		794	
	Temperature (°C)	24.8	24.4	24.6	24.4	25.2	24.4	25.1	24.1
450 mg KCl/L	pH (S.U.)	7.86	7.70	7.93	7.59	7.89	7.78	7.94	7.69
	DO (mg/L)	7.7	6.3	8.1	6.4	7.9	7.4	7.6	6.9
	Conductivity (µmhos/cm)	1140		1090		1110		1080	
	Temperature (°C)	24.8	24.2	24.7	24.4	25.1	24.5	25.2	24.1
600 mg KCl/L	pH (S.U.)	7.86	7.72	7.92	7.61	7.90	7.72	7.95	7.71
	DO (mg/L)	7.7	6.7	7.2	6.7	7.9	7.2	7.6	7.0
	Conductivity (µmhos/cm)	1320		1320		1350		1320	
	Temperature (°C)	24.7	24.2	24.7	24.4	25.1	24.5	25.0	24.4
750 mg KCl/L	pH (S.U.)	7.87	7.73	7.92	7.57	7.89	7.69	7.95	7.67
	DO (mg/L)	7.8	6.9	7.2	6.5	8.1	7.2	7.7	7.0
	Conductivity (µmhos/cm)	1550		1590		1620		1560	
	Temperature (°C)	24.6	24.2	24.8	24.3	24.8	24.6	25.0	24.2
900 mg KCl/L	pH (S.U.)	7.86	7.73	7.92	7.71	7.89	7.81	7.95	7.72
	DO (mg/L)	7.8	6.8	7.2	7.0	8.1	7.5	7.9	7.2
	Conductivity (µmhos/cm)	1830		1810		1910		1900	
	Temperature (°C)	24.6	24.3	24.8	24.4	25.0	24.6	25.0	24.2
STOCK	Conductivity (µmhos/cm)	76800				77200			
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

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



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

— — · **Central Tendency** (mean IC_{25})

—··—·· **Warning Limits** (mean $IC_{25} \pm S_{A.10}$ or $S_{A.75}$)

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

Environmental Testing Solutions, Inc.

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

Test number	Test date	7-day IC_{25} (g/L NaCl)	CT (g/L NaCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	S_{A10}	Laboratory Warning Limits CT - S_{A10}	CT + S_{A10}	S_{A25}	Laboratory Control Limits CT - S_{A25}	CT + S_{A25}	S_{A75}	USEPA Warning Limits CT - S_{A75}	CT + S_{A75}	S_{A90}	USEPA Control Limits CT - S_{A90}	CT + S_{A90}	CV
1	02-03-04	1.06																	
2	03-03-04	1.07	1.07	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
3	04-06-04	1.07	1.07	0.01	1.06	1.08	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.00
4	05-04-04	1.07	1.07	0.00	1.06	1.08	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.00
5	06-08-04	1.06	1.07	0.01	1.06	1.08	0.09	0.98	1.15	0.18	0.89	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
6	07-07-04	1.06	1.07	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
7	08-10-04	1.06	1.06	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.59	1.54	0.66	0.40	1.72	0.01
8	09-14-04	1.05	1.06	0.01	1.05	1.08	0.08	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
9	09-14-04	1.07	1.06	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
10	10-05-04	1.07	1.06	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.72	0.01
11	11-02-04	1.06	1.06	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
12	12-07-04	1.08	1.07	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
13	01-11-05	1.06	1.06	0.01	1.05	1.08	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.72	0.01
14	02-08-05	1.05	1.06	0.01	1.04	1.08	0.09	0.98	1.15	0.18	0.88	1.24	0.48	0.58	1.54	0.66	0.40	1.72	0.01
15	03-01-05	1.08	1.06	0.01	1.04	1.08	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.72	0.01
16	04-05-05	1.09	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
17	05-03-05	1.07	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.55	0.66	0.41	1.73	0.01
18	06-07-05	1.05	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
19	07-12-05	1.06	1.07	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.73	0.01
20	07-12-05	1.06	1.06	0.01	1.04	1.09	0.09	0.98	1.15	0.18	0.88	1.25	0.48	0.59	1.54	0.66	0.40	1.72	0.01

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

CT = Central tendency (mean IC_{25}).

S = Standard deviation of the IC_{25} values.

Laboratory Control and Warning Limits

Laboratory control and warning limits were established using the standard deviation of the IC_{25} values corresponding to the 10th and 25th percentile CVs. These ranges are more stringent than the control and warning limits recommended by USEPA for the test method and endpoint.

S_{A10} = Standard deviation corresponding to the 10th percentile CV. (S_{A10} = 0.08)

S_{A25} = Standard deviation corresponding to the 25th percentile CV. (S_{A25} = 0.17)

USEPA Control and Warning Limits

S_{A75} = Standard deviation corresponding to the 75th percentile CV. (S_{A75} = 0.45)

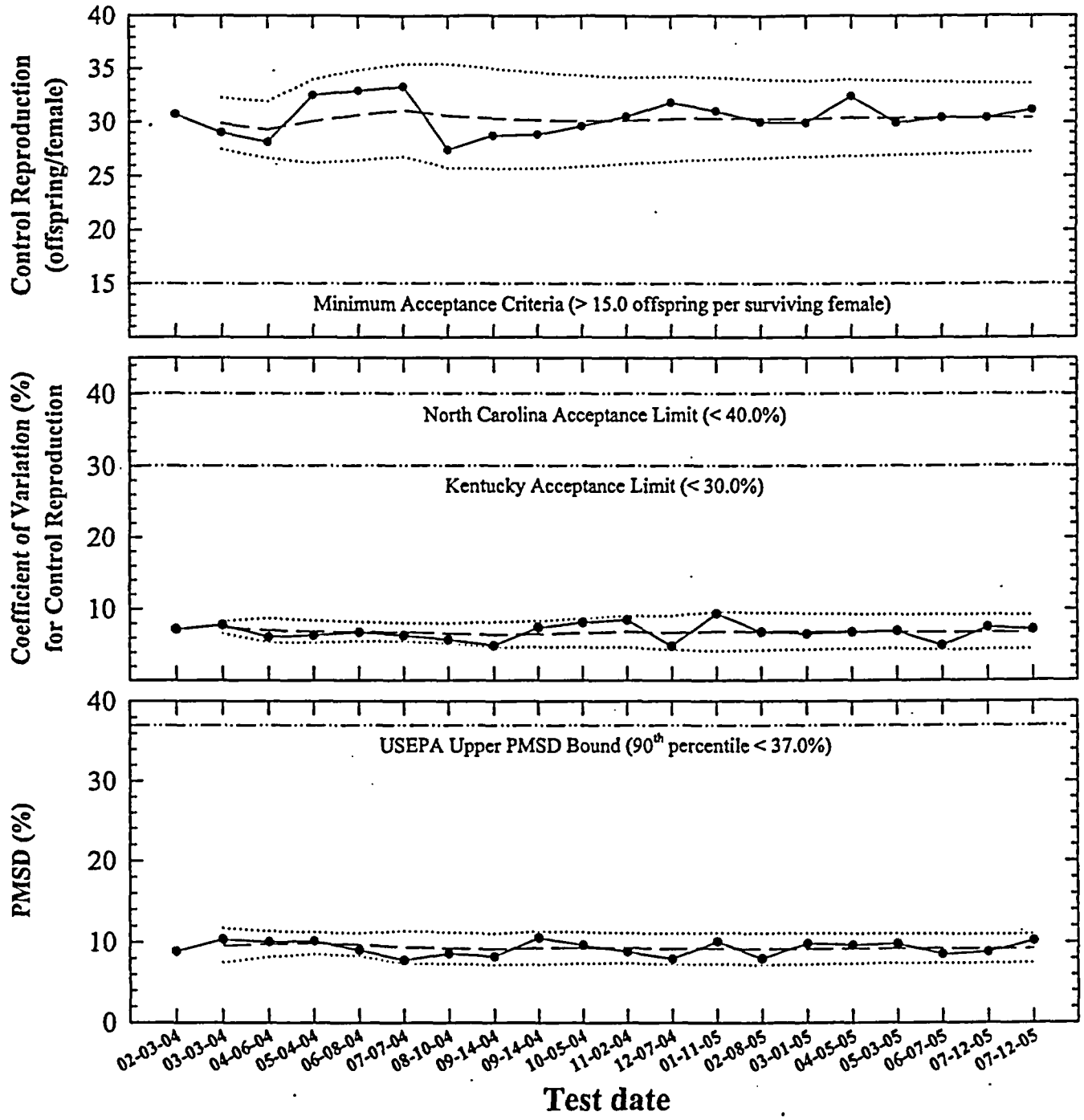
S_{A90} = Standard deviation corresponding to the 90th percentile CV. (S_{A90} = 0.62)

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

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

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia Control Reproduction, Coefficient of Variation, and PMSD in Sodium Chloride Chronic Reference Toxicant Tests



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

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

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

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

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

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CT for Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	02-03-04	100	30.7		7.2		2.7	8.8	
2	03-03-04	100	29.0	29.9	7.8	7.5	3.0	10.3	9.6
3	04-06-04	100	28.1	29.3	6.2	7.1	2.8	10.0	9.7
4	05-04-04	100	32.5	30.1	6.4	6.9	3.3	10.1	9.8
5	06-08-04	100	32.9	30.6	6.8	6.9	3.0	9.0	9.7
6	07-07-04	100	33.3	31.1	6.3	6.8	2.6	7.8	9.3
7	08-10-04	100	27.4	30.6	5.8	6.6	2.3	8.6	9.2
8	09-14-04	100	28.7	30.3	4.9	6.4	2.4	8.2	9.1
9	09-14-04	100	28.8	30.2	7.5	6.5	3.0	10.5	9.3
10	10-05-04	100	29.6	30.1	8.2	6.7	2.8	9.6	9.3
11	11-02-04	100	30.5	30.1	8.5	6.9	2.7	8.8	9.3
12	12-07-04	100	31.8	30.3	4.9	6.7	2.5	7.9	9.1
13	01-11-05	100	31.0	30.3	9.4	6.9	3.1	10.0	9.2
14	02-08-05	100	30.0	30.3	6.8	6.9	2.4	8.0	9.1
15	03-01-05	100	29.9	30.3	6.6	6.9	2.9	9.9	9.2
16	04-05-05	100	32.4	30.4	6.9	6.9	3.1	9.6	9.2
17	05-03-05	100	29.9	30.4	7.0	6.9	2.9	9.8	9.2
18	06-07-05	100	30.4	30.4	5.0	6.8	2.6	8.5	9.2
19	07-12-05	100	30.4	30.4	7.5	6.8	2.7	8.8	9.2
20	07-12-05	100	31.1	30.4	7.2	6.8	3.2	10.2	9.2

Note:

CV = Coefficient of variation for control reproduction.
On average, the CV for control reproduction is 6.8% in Environmental Testing Solutions, Inc. *Ceriodaphnia* chronic toxicity tests.
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.2% from the control.
Lower PMSD bound determined by USEPA (10th percentile) = 11%.
Upper PMSD bound determined by USEPA (90th percentile) = 37%.

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

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

07-12-05new

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

NEW ALGAE

CdNaCLCR #: 38

Dilution preparation information:						*Comments:*
NaCl CHM number:		CHM 120				
Stock preparation:		100 g NaCl/l (dissolve 50 g NaCl in 500 ml deionized water)				
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism information:		*Test information:*	
Organism age:	< 24-hours old	Randomizing template:	ORANGE
Date and times organisms were born between:	07-11-05 1643 TO 2006	Incubator number and shelf location:	2B2
Organism source:	07-05-05 A-F	YCT batch:	06-12-05
Transfer bowl information:	pH = 7.81 SU Temperature = 25.8°C	*Selenastrum* batch:	06-17-05

Daily renewal information:

Day	Date	Test initiation, renewal, or termination time	MHS water batch used	Analyst
0	07-12-05	0845	07-08-05 A	JL
1	07-13-05	0909	07-08-05 B	JL
2	07-14-05	0807	07-08-05 C	JL
3	07-15-05	0810	07-08-05 C	JL
4	07-16-05	0850	07-08-05 C	JL
5	07-17-05	0820	07-13-05 A	JL
6	07-18-05	0819	07-13-05 B	JL
7	07-19-05	0813		JL

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	≤ 20%	7-day LC50	>1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	31.1	≥ 15.0 offspring/female	ChV	894.4
% CV:	7.2%	< 40.0 %	IC25	1057.9

Species: *Ceriodaphnia dubia*

New ALGAE

CdNaCLCR #: 38

CONTROL

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	5	5	5	4	5	5	4	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	10	13	10	9	10	9	11	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	13	0	0	0	0	0	*1	0	16	14
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	14	17	17	17	15	18	17	0	0
Total young produced		28	29	35	32	30	30	33	32	33	29
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

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

* CARRY OVER

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.1

600 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	5	5	5	5	5	5	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	10	10	12	10	9	10	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	16	14	0	0	15	15
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	13	16	16	0	0	18	14	0	0
Total young produced		31	28	31	31	33	29	32	28	30	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	30.3
% Reduction from Control:	2.6%

Species: *Ceriodaphnia dubia*

New ALGAE

CdNaCLCR #: 38

800 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	3	6	4	5	4	4	5	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	10	11	9	9	9	12	11	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	13	15	17
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	15	17	14	13	16	16	0	0	0
Total young produced		28	32	31	30	26	29	30	29	30	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	29.6
% Reduction from Control:	4.8%

1000 mg NaCl/L

Survival and Reproduction Data

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	3	5	6	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	9	10	10	10	8	10	8	11	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	14	0	0	0	0	0	0	0	0	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	0	12	14	15	13	13	13	9	14	0
Total young produced		27	25	29	28	28	27	27	21	29	27
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	26.8
% Reduction from Control:	13.8%

Species: *Ceriodaphnia dubia*

New ALGAE

CdNaCLCR #: 38

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	4	4	5	4	4	3	3	4	4	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	6	6	4	10	8	7	7	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	4	6
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	6	0	0	9	7	4	5	5	0	0
Total young produced		18	10	11	17	21	15	15	16	12	13
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	14.8
% Reduction from Control:	-52.4%

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	D	L	D	L
4	Young produced	4	3	2	3	4	3		2		2
	Adult mortality	L	L	L	L	L	L		L		L
5	Young produced	7	3	6	5	4	4		3		3
	Adult mortality	L	L	L	L	L	L		L		L
6	Young produced	0	0	0	0	0	0		0		1
	Adult mortality	L	L	L	L	L	L		L		L
7	Young produced	5	0	4	6	3	4		4		0
Total young produced		16	6	12	14	11	11	0	9	0	6
Final Adult Mortality		L	L	L	L	L	L	D	L	D	L

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

Concentration:	
% Mortality:	20%
Mean Offspring/Female:	8.5
% Reduction from Control:	72.7%

Environmental Testing Solutions, Inc.

Verification of *Ceriodaphnia* Reproduction Totals

Control

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	5	5	5	4	5	5	4	5	5	46
5	12	10	13	10	9	10	9	11	12	10	106
6	13	0	0	0	0	0	1	0	16	14	44
7	0	14	17	17	17	15	18	17	0	0	115
Total	28	29	35	32	30	30	33	32	33	29	311

1000 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	3	5	6	4	4	4	4	43
5	9	9	10	10	10	8	10	8	11	11	96
6	14	0	0	0	0	0	0	0	0	12	26
7	0	12	14	15	13	13	13	9	14	0	103
Total	27	25	29	28	28	27	27	21	29	27	268

600 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	5	5	5	5	5	5	4	4	5	46
5	11	10	10	10	12	10	9	10	11	10	103
6	0	0	0	0	16	14	0	0	15	15	60
7	17	13	16	16	0	0	18	14	0	0	94
Total	31	28	31	31	33	29	32	28	30	30	303

1200 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	4	5	4	4	3	3	4	4	3	38
5	8	6	6	4	10	8	7	7	4	4	64
6	0	0	0	0	0	0	0	0	4	6	10
7	6	0	0	9	7	4	5	5	0	0	36
Total	18	10	11	17	21	15	15	16	12	13	148

800 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	6	4	5	4	4	5	4	4	4	43
5	10	11	10	11	9	9	9	12	11	10	102
6	0	0	0	0	0	0	0	13	15	17	45
7	15	15	17	14	13	16	16	0	0	0	106
Total	28	32	31	30	26	29	30	29	30	31	296

1400 mg NaCl/L

Day	Replicate number										Total
	1	2	3	4	5	6	7	8	9	10	
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	3	2	3	4	3	0	2	0	2	23
5	7	3	6	5	4	4	0	3	0	3	35
6	0	0	0	0	0	0	0	0	0	1	1
7	5	0	4	6	3	4	0	4	0	0	26
Total	16	6	12	14	11	11	0	9	0	6	85

Environmental Testing Solutions, Inc.

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

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

Test number: CdNaClCR #67 (#38 at 351 Depot St.)
UTEX Algae

Test dates: July 12-19, 2005

Reviewed by:

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	28	29	35	32	30	30	33	32	33	29	100	31.1	7.2	*Not applicable*
600	31	28	31	31	33	29	32	28	30	30	100	30.3	5.4	2.6
800	28	32	31	30	26	29	30	29	30	31	100	29.6	5.8	4.8
1000	27	25	29	28	28	27	27	21	29	27	100	26.8	8.8	13.8
1200	18	10	11	17	21	15	15	16	12	13	100	14.8	22.9	52.4
1400	16	6	12	14	11	11	0	9	0	6	80	8.5	64.3	72.7

Dunnett's MSD value: 3.165
PMSD: 10.2

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test. On average, a significant difference occurs for Environmental Testing Solutions, Inc. chronic toxicity tests when a toxicant reduces *Ceriodaphnia* reproduction by 9.2% from the control.

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

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

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

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

Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	7/12/2005	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	7/19/2005	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	29.000	35.000	32.000	30.000	30.000	33.000	32.000	33.000	29.000
600	31.000	28.000	31.000	31.000	33.000	29.000	32.000	28.000	30.000	30.000
800	28.000	32.000	31.000	30.000	26.000	29.000	30.000	29.000	30.000	31.000
1000	27.000	25.000	29.000	28.000	28.000	27.000	27.000	21.000	29.000	27.000
1200	18.000	10.000	11.000	17.000	21.000	15.000	15.000	16.000	12.000	13.000
1400	16.000	6.000	12.000	14.000	11.000	11.000	0.000	9.000	0.000	6.000

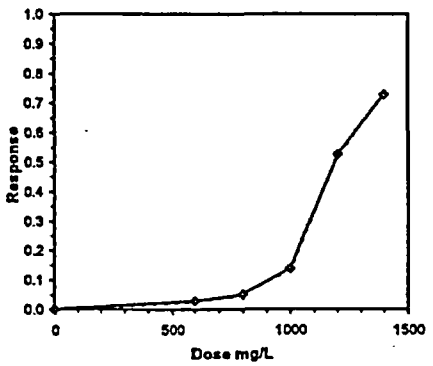
			Transform: Untransformed					Rank	1-Tailed	Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Mean	N-Mean
D-Control	31.100	1.0000	31.100	28.000	35.000	7.182	10			31.100	1.0000
600	30.300	0.9743	30.300	28.000	33.000	5.401	10	95.00	75.00	30.300	0.9743
800	29.600	0.9518	29.600	26.000	32.000	5.786	10	87.50	75.00	29.600	0.9518
*1000	26.800	0.8617	26.800	21.000	29.000	8.760	10	60.00	75.00	26.800	0.8617
*1200	14.800	0.4759	14.800	10.000	21.000	22.924	10	55.00	75.00	14.800	0.4759
*1400	8.500	0.2733	8.500	0.000	16.000	64.259	10	55.00	75.00	8.500	0.2733

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.99586135	1.035	-0.4676475	1.52342436
Bartlett's Test indicates unequal variances (p = 1.15E-03)	20.2003574	15.0862722		

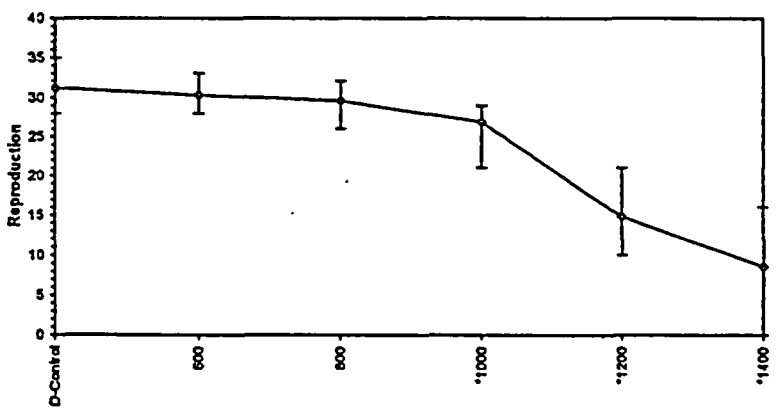
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	800	1000	894.427191	
Treatments vs D-Control				

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	803.928571	125.04885	440.176515	898.220443	-1.1130
IC10	915	58.0228951	818.845238	1008.03634	-0.3168
IC15	1006.08333	29.7439229	923.373386	1032.54913	-1.2821
IC20	1032	15.1765532	1000.23143	1057.05037	-0.5082
IC25	1057.91667	13.8219825	1029.75462	1082.37967	-0.2823
IC40	1135.66667	14.3046107	1108.67965	1164.35622	0.1112
IC50	1187.5	18.8570691	1158.93744	1232.04375	0.5455



Dose-Response Plot



07-12-05new

Environmental Testing Solutions, Inc.
Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	7/12/2005	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	7/19/2005	Lab ID:	BTS-Envir. Testing Sol.	Sample Type:	NACL-Sodium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	29.000	35.000	32.000	30.000	30.000	33.000	32.000	33.000	29.000
600	31.000	28.000	31.000	31.000	33.000	29.000	32.000	28.000	30.000	30.000
800	28.000	32.000	31.000	30.000	26.000	29.000	30.000	29.000	30.000	31.000
1000	27.000	25.000	29.000	28.000	28.000	27.000	27.000	21.000	29.000	27.000
1200	18.000	10.000	11.000	17.000	21.000	15.000	15.000	16.000	12.000	13.000
1400	16.000	6.000	12.000	14.000	11.000	11.000	0.000	9.000	0.000	6.000

			Transform: Untransformed						1-Tailed	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	31.100	1.0000	31.100	28.000	35.000	7.182	10			
600	30.300	0.9743	30.300	28.000	33.000	5.401	10	0.578	2.287	3.165
800	29.600	0.9518	29.600	26.000	32.000	5.786	10	1.084	2.287	3.165
*1000	26.800	0.8617	26.800	21.000	29.000	8.760	10	3.107	2.287	3.165
*1200	14.800	0.4759	14.800	10.000	21.000	22.924	10	11.778	2.287	3.165
*1400	8.500	0.2733	8.500	0.000	16.000	64.259	10	16.331	2.287	3.165

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.99586135	1.035	-0.46764754	1.52342436
Bartlett's Test indicates unequal variances (p = 1.15E-03)	20.2003574	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		3.16452289	0.10175315	905.576667	9.57592593	1.9E-25	5,54
Treatments vs D-Control										

07-12-05new

Species: *Ceriodaphnia dubia*

New ALGAE
CdNaCLCR #: 38

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	KEK KJR	KEK	KEK	KEK	KEK	KEK
Concentration	Parameter						
CONTROL	pH (S.U.)	7.81	7.88	7.86	8.07	7.89	7.89
	DO (mg/L)	8.06	7.8	8.0	7.8	8.0	7.5
	Conductivity (µmhos/cm)	300		305		304	
	Alkalinity (mg $CaCO_3$/L)	60		58		59	
	Hardness (mg $CaCO_3$/L)	84		80		82	
	Temperature (°C)	24.6	24.9	24.7	25.0	24.6	24.5
600 mg NaCl/L	pH (S.U.)	7.78	7.74	7.88	7.91	7.92	7.77
	DO (mg/L)	7.89	7.9	7.8	7.8	8.0	7.5
	Conductivity (µmhos/cm)	1490		1450		1450	
	Temperature (°C)	24.6	24.8	24.8	25.2	24.7	24.5
800 mg NaCl/L	pH (S.U.)	7.79	7.74	7.86	7.86	7.92	7.75
	DO (mg/L)	7.87	7.9	8.1	7.9	8.0	7.6
	Conductivity (µmhos/cm)	1900		1890		1880	
	Temperature (°C)	24.6	24.7	24.7	25.0	24.7	24.5
1000 mg NaCl/L	pH (S.U.)	7.79	7.72	7.85	7.86	7.91	7.74
	DO (mg/L)	8.01	8.0	8.1	7.9	8.0	7.6
	Conductivity (µmhos/cm)	2330		2260		2250	
	Temperature (°C)	24.4	24.7	24.7	25.1	24.7	24.7
1200 mg NaCl/L	pH (S.U.)	7.77	7.71	7.85	7.84	7.90	7.72
	DO (mg/L)	7.93	8.0	8.1	7.9	8.0	7.6
	Conductivity (µmhos/cm)	2760		2670		2680	
	Temperature (°C)	24.5	24.7	24.7	25.0	24.7	24.5
1400 mg NaCl/L	pH (S.U.)	7.76	7.70	7.84	7.83	7.90	7.71
	DO (mg/L)	7.95	7.9	8.1	7.9	8.0	7.7
	Conductivity (µmhos/cm)	3080		2050		3010	
	Temperature (°C)	24.5	24.8	24.7	24.9	24.8	24.5
STOCK	Conductivity (µmhos/cm)	136000					
		Initial	Final	Initial	Final	Initial	Final

Species: *Ceriodaphnia dubia*

New ALGAE

CdNaCLCR #: 38

		Day							
		3		4		5		6	
	Analyst	KEK	KJR	KJR	KJR	KJR	KJR	KJR	AAB
Concentration	Parameter								
CONTROL	pH (S.U.)	7.73	7.85	7.95	7.89	7.82	7.87	7.82	7.83
	DO (mg/L)	8.0	7.35	7.74	7.4	7.7	7.7	8.3	~~7.2~~ AB
	Conductivity (µmhos/cm)	301		302		315		308	
	Alkalinity (mg $CaCO_3$/L)					63		61	
	Hardness (mg $CaCO_3$/L)					82		86	
	Temperature (°C)	24.7	25.1	24.6	24.9	24.6	24.7	24.9	24.8
600 mg NaCl/L	pH (S.U.)	7.80	~~7.86~~ 7.85	~~7.83~~ 7.80	7.79	7.79	7.80	7.85	7.73
	DO (mg/L)	7.9	7.30	7.74	7.4	7.6	7.8	7.8	~~7.3~~ AB
	Conductivity (µmhos/cm)	1430		1420		1450		1460	
	Temperature (°C)	24.7	25.0	24.5	25.1	24.7	24.6	24.8	24.6
800 mg NaCl/L	pH (S.U.)	7.79	~~7.87~~ 7.88	~~7.82~~ 7.89	7.78	7.80	7.78	7.85	7.72
	DO (mg/L)	8.0	7.42	7.70	7.4	7.7	7.7	7.9	~~7.4~~ AB
	Conductivity (µmhos/cm)	1880		1870		1840		1810	
	Temperature (°C)	24.7	25.1 7.85	24.6 7.89	25.1	24.6	24.8	24.8	24.6
1000 mg NaCl/L	pH (S.U.)	7.77	~~7.87~~ 7.80	~~7.82~~ 7.89	7.78	7.79	7.77	7.84	7.72
	DO (mg/L)	7.9	7.51	7.75	7.6	7.7	7.7	7.9	~~8.5~~ AB
	Conductivity (µmhos/cm)	2310		2250		2240		2240	
	Temperature (°C)	24.7	25.1	24.7	25.1	24.6	24.6	24.9	24.9
1200 mg NaCl/L	pH (S.U.)	7.77	~~7.90~~ 7.81	~~7.79~~ 7.79	7.75	7.79	7.75	7.83	7.70
	DO (mg/L)	8.0	7.37	7.67	7.5	7.8	7.8	7.9	~~7.5~~ AB
	Conductivity (µmhos/cm)	2750		2690		2640		2590	
	Temperature (°C)	24.6	25.2	24.6	25.2	24.6	24.6	24.8	24.8
1400 mg NaCl/L	pH (S.U.)	7.77	~~7.87~~ 7.80	~~7.80~~ 7.89	7.73	7.78	7.74	7.82	7.71
	DO (mg/L)	8.0	7.73	7.70	7.8	7.7	8.1	7.9	~~7.5~~ AB
	Conductivity (µmhos/cm)	3090		3000		2960		3050	
	Temperature (°C)	24.7	25.0	24.6	25.0	24.5	24.6	24.8	24.9
STOCK	Conductivity (µmhos/cm)					121000			
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 Y
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	04	08	01	To	05	07	31

MAJOR
(SUBR 01)
F - FINAL
ANNUAL MONITORING (PCBS)
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			
POLYCHLORINATED BIPHENYLS	SAMPLE MEASUREMENT	********	********	**	********	********	<0.0	19	0	1 / 365	GRAB
39521 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.0	MG/L		ANNUAL	GRAB
	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	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	TELEPHONE		DATE		
J. Randy Douet Site Vice President			423	843-6700	05	08	10
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	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			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	6.8	********	8.7	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	103	118	26	********	12	13	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	<42	<45	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	1.062	1.270	03	********	********	********	**	0	31 / 31	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		DAILY	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	05	08	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	31

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

*** NO DISCHARGE [XX] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	05	08	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

ATTN: Stephanie A. Howard

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

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	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	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	COMPOS
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	05	08	10
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	117 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	05	07	01	To	05	07	31

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

*** NO DISCHARGE [XX] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read Instructions before completing this form.

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

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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.