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

July 12, 2010

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

Dear Mr. Patrick Cromer:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR JUNE 2010 AND CORRECTION TO DISCHARGE MONITORING REPORT FOR MAY 2010

Enclosed is the June 2010 Discharge Monitoring Report for Sequoyah Nuclear Plant. Also, enclosed is the correction to the Discharge Number 101 T, Biomonitoring for Outfall 101 for May 2010. If you have any questions or need additional information, please contact Stephanie Howard at (423) 843-6700 of Sequoyah's Environmental staff.

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.

Sincerely,

Christopher R. Church
Site Vice President
Sequoyah Nuclear Plant

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

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

IE25
NRR

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	30.4	04	0	30 / 30	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	39.7	04	0	30 / 30	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	1.4	04	0	30 / 30	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0 DAILY MX	DEG. C.		CONTIN UOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	7.3	********	7.6	12	0	5 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	7	7	19	0	1 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		MONTHLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	1 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		MONTHLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1644	03	********	********	********	**	0	30 / 30	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No closed mode operation. The following information is included in an attachment: CCW data

DMR Attachment

CCW Data

CCW TRENCH				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
No water would come out of the pump. No sample could be obtained.				
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
06/16/2010 @ 1323	<0.10 mg/l	06/18/2010 @ 0140	KMF	EPH

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.022	0.032	19	0	23 / 30	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.10 MO AVG	0.10 INST MAX	MG/L		WEEK-DAYS	CALCTD
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	0	62	********	********		**	0	30 / 30	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	2 DAILY MX	DEG C/HR	********	********	********	****		CONTINUOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

The following injections occurred: 1. Floguard MS6236 (max. calc. conc. was 0.032mg/L--limit 0.2mg/L) 2. Biodetergent 73551 (max. calc. conc. was 0.017mg/L--limit 2.0mg/L) 3. Spectrus CT1300 (max. calc. conc. was 0.04mg/L--limit 0.050mg/L) 4. Spectrus CT 1300(low detection level analytical method was <0.05mg/L--limit 0.050mg/L)

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 Q
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	04	01	To	10	06	30

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
BORON, TOTAL	SAMPLE MEASUREMENT	********	********	**		<0.20		19	0	1 / 91	
01022 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	REPORT	********	MG/L		QTRLY	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			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Boron was sampled on 4/14/2010.

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	Monitoring Not Required	********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	Monitoring Not Required	********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was not sampled in June 2010.

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

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

ATTN: Stephanie A. Howard

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

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

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

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	********	********	**	6.9	********	7.9	12	0	13 / 30	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	74	108	26	********	7	10	19	0	5 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<60	<76	26	********	<6	<6	19	0	5 / 30	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.206	1.506	03	********	********	********	**	0	30 / 30	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		SEE PERMIT	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	04	********	********		04			
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	DEG C	********	********	38.3 DAILY MX	DEG C		DAILY	GRAB-4
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	********		19			
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.10 DAILY MX	MG/L		WEEKLY	GRAB-4
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	110 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

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

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEMI ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

No Discharge this Period

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

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

ATTN: Stephanie A. Howard

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

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	117 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

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

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

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

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

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

ATTN: Stephanie A. Howard

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

TN0026450	118 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	06	01	To	10	06	30

MAJOR
(SUBR 01)
F - FINAL
WASTEWATER & STORM WATER
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			
OXYGEN, DISSOLVED (DO)	SAMPLE MEASUREMENT	********	********	**	5.0	********	********	19	0	2 / 30	GRAB
00300 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	2.0 DAILY MN	********	********	MG/L		TWICE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********	13	19	0	2 / 30	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	100 DAILY MX	MG/L		TWICE/ WEEK	GRAB
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	********	********	**	********	********	<0.1	25	0	2 / 30	GRAB
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	0.510	0.510	03	********	********	********	**	0	1 / 30	ESTIMA
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	*		ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

The Dredge Pond (Outfall 118) was discharged June 9-11, 2010.

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

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

ATTN: Stephanie A. Howard

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

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD	YEAR	MO	DAY		YEAR	MO	DAY
From	10	05	01	To	10	05	31

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

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	>100.0	********	********	23	0	1 / 180	COMPOS
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
Christopher R. Church Sequoyah Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Sequoyah Site Vice President SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-7001	10	07	09
TYPED OR PRINTED			AREA CODE	NUMBER	YEAR	MO	DAY

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

Toxicity was sampled May 9-14, 2010. Report is attached.

June 10, 2010

Ruth Ann Hurt, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, COMPLIANCE TOXICITY TESTS, MAY, 2010

Per your request, I am only submitting an electronic copy of the subject report. The report provides results of compliance testing using fathead minnows and daphnids. Outfall 101, samples collected May 9-14, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values for both species were > 100 percent. Exposure of fathead minnows and daphnids to intake samples resulted in no significant differences from controls during this study period.

Fathead minnows were also exposed to UV treated Outfall 101 and intake samples since fish pathogens present in intake water have been the suspected cause of interference (anomalous dose response and high variability among replicates) in previous toxicity testing at Sequoyah.

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

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

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

SQN May 2010M

TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT

INTRODUCTION / EXECUTIVE SUMMARY

Report Date: June 10, 2010

1. Facility / Discharger: Sequoyah Nuclear Plant / TVA
2. County / State: Hamilton / Tennessee
3. NPDES Permit #: TN0026450
4. Type of Facility: Nuclear-Fueled Electric Generating Plant
5. Design Flow (MGD): 1,579
6. Receiving Stream: Tennessee River (TRM 483.6)
7. 1Q10: 3,491
8. Outfall Tested: 101
9. Dates Sampled: May 9-14, 2010
10. Average Flow on Days Sampled (MGD): 1625.40, 1639.25, 1649.92
11. Pertinent Site Conditions: Spectrus CT 1300 (non-oxidizing biocide used for mollusk control) was injected into the ERCW B train beginning on 5/11/10 @ 1145 through 5/14/109 @ 1520.
12. Test Dates: May 11-18, 2010
13. Test Type: Short-term Chronic Definitive
14. Test Species: Fathead Minnows (*Pimephales promelas*)
    Daphnids (*Ceriodaphnia dubia*)
15. Concentrations Tested (%): Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
    Intake: 100.0
    Pimephales promelas: UV treated Outfall 101: 11.3, 22.6, 45.2, 72.6, 100
    UV treated Intake: 100.0
16. Permit Limit Endpoint (%): Outfall 101: IC_{25} = 45.2%
17. Test Results: Outfall 101: *Pimephales promelas:* IC_{25} > 100%
    Ceriodaphnia dubia: IC_{25} > 100%

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

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

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

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

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

22. Notes: Outfall 101 samples collected May 9-14, 2010, showed no toxic effects to fathead minnows or daphnids. The resulting IC_{25} values, for both species, were > 100 percent.

    Exposure of daphnids to intake samples resulted in no significant difference from the control during this study period.

    Minnow growth in the intake samples was significantly lower than the control.

    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.

METHODS SUMMARY

Samples:

1. Sampling Point: Outfall 101, Intake

2. Sample Type: Composite

3. Sample Information:

Sample ID	Date (MM-DD-YY) Time (ET) Collected	Date (MM-DD-YY) Time (ET) Received	Arrival Temp.† (°C)	Initial TRC* (mg/L)	Date (MM-DD-YY) Time (ET) Last Used By
101	05-09-10 0701 to 05-10-10 0601	05-10-10 1445	1.7, 2.1	<0.10	05-11-10 1329 05-12-10 1230
Intake	05-09-10 0828 to 05-10-10 0728	05-10-10 1445	0.9	<0.10	05-11-10 1329 05-12-10 1230
101	05-11-10 0656 to 05-12-10 0556	05-12-10 1425	1.3, 1.4	<0.10	05-13-10 1233 05-14-10 1232
Intake	05-11-10 0713 to 05-12-10 0613	05-12-10 1425	0.8	<0.10	05-13-10 1233 05-14-10 1232
101	05-13-10 0653 to 05-14-10 0553	05-14-10 1425	2.2, 1.4	<0.10	05-15-10 1233 05-16-10 1231 05-17-10 1234
Intake	05-13-10 0711 to 05-14-10 0611	05-14-10 1425	2.2	<0.10	05-15-10 1233 05-16-10 1231 05-17-10 1234

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

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

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

	Pimephales promelas	*Ceriodaphnia dubia*
Test Organisms:		
1. Source:	Aquatox, Inc.	In-house Cultures
2. Age:	19.87 – 20.13 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	05-11-10 1152 ET	05-11-10 1329 ET
UV Treated Outfall 101	05-11-10 1208 ET	
7. Test Termination: (Date/Time)		
Outfall 101	05-18-10 1120 ET	05-18-10 1250 ET
UV Treated Outfall 101	05-18-10 1137 ET	
8. Test Temperature: Outfall 101:	Mean = 24.7°C (24.2 – 25.0°C)	Mean = 24.9°C (24.6 - 25.3°C)
Test Temperature: UV-Treated Outfall 101:	Mean = 24.8°C (24.2 - 25.2°C)	

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

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted May 11 – 18, 2010 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.978	0.991	0.875	0.893	0.934
11.3%	0.832	0.922	1.037	0.871	0.916
22.6%	0.797	0.793	0.882	0.973	0.861
45.2%	0.738	0.910	0.852	0.888	0.847
72.6%	0.859	0.855	0.984	0.950	0.912
100.0%	0.859	0.882	0.927	0.886	0.889
Intake	0.754	0.725	0.669	0.757	0.726

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

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted May 11 – 18, 2010 using effluent from Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Reproduction (#young/female/7 days) Data (replicate number)										
	1	2	3	4	5	6	7	8	9	10	Mean
Control	30	28	30	27	27	31	28	29	30	28	28.8
11.3%	30	34	29	31	33	33	31	30	30	32	31.3
22.6%	33	30	34	34	31	32	34	30	30	36	32.4
45.2%	34	36	32	33	34	33	34	31	35	30	33.2
72.6%	39	31	34	34	33	37	31	36	35	34	34.4
100.0%	36	39	35	39	36	32	34	34	32	37	35.4

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

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

TOXICITY TEST RESULTS (see Appendix C for Bench Sheets)

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

Conducted May 11 – 18, 2010 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	30	27	31	32	30	30	28	29	29	29	29.5
Intake	37	33	33	34	34	34	37	33	36	37	34.8

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 May 11 – 18, 2010 using effluent from UV Treated Outfall 101.

Test Solutions (% Effluent)	Percent Surviving (time interval used – days)						
	1	2	3	4	5	6	7
Control	100	100	100	100	100	100	100
11.3%	100	100	100	100	100	100	100
22.6%	100	100	100	100	100	100	100
45.2%	100	100	100	100	100	100	100
72.6%	100	100	100	100	100	100	100
100.0%	100	100	100	100	100	100	100
Intake	100	100	100	100	100	100	100

Test Solutions (% Effluent)	Mean Dry Weight (mg) (replicate number)				
	1	2	3	4	Mean
Control	0.822	0.979	0.824	0.962	0.897
11.3%	0.936	0.861	0.848	0.970	0.904
22.6%	0.790	0.786	0.905	0.742	0.806
45.2%	0.880	0.845	0.888	0.909	0.881
72.6%	0.864	0.875	0.870	0.861	0.868
100.0%	0.811	0.874	0.808	0.846	0.835
Intake	0.841	0.765	0.791	0.811	0.802

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	May 11 – 18, 2010	1115	7-days	KCl	0.72 g/L
Ceriodaphnia dubia	May 04 – 11, 2010	0908	6-days	NaCl	1.09 g/L

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* and *Ceriodaphnia dubia* Tests, Non-treated Sequoyah Nuclear Plant (SQN) Outfall 101 performed May 11 - 18, 2010.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness	Total Residual
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)	Chlorine (mg/L)
Pimephales promelas	Control	24.7 24.6 - 24.8	24.5 24.2 - 24.7	7.9 7.7 - 8.1	7.8 7.6 - 8.1	7.53 7.41 - 7.64	7.57 7.51 - 7.61	329 324 - 336	63 62 - 64	95 94 - 98	
	11.3%	24.7 24.7 - 24.9	24.5 24.4 - 24.7	7.8 7.6 - 8.1	7.8 7.6 - 8.0	7.54 7.46 - 7.60	7.56 7.49 - 7.63	304 299 - 314			
	22.6%	24.8 24.7 - 24.9	24.6 24.3 - 24.8	7.8 7.6 - 8.1	7.8 7.6 - 8.0	7.55 7.47 - 7.61	7.54 7.50 - 7.63	287 282 - 294			
	45.2%	24.8 24.7 - 24.9	24.6 24.2 - 24.9	7.9 7.7 - 8.2	7.8 7.6 - 8.1	7.55 7.47 - 7.60	7.54 7.50 - 7.63	255 252 - 258			
	72.6%	24.8 24.7 - 24.9	24.6 24.3 - 24.7	7.9 7.8 - 8.2	7.8 7.7 - 8.1	7.55 7.46 - 7.60	7.53 7.48 - 7.61	209 202 - 214			
	100.0%	24.9 24.8 - 25.0	24.5 24.3 - 24.7	7.9 7.8 - 8.2	7.9 7.6 - 8.1	7.54 7.46 - 7.58	7.52 7.46 - 7.59	167 162 - 169	61 60 - 62	68 67 - 69	< 0.10 < 0.10 - < 0.10
	Intake	24.8 24.6 - 25.0	24.5 24.3 - 24.6	8.0 7.8 - 8.3	7.8 7.6 - 8.1	7.54 7.47 - 7.59	7.51 7.45 - 7.58	166 160 - 171	61 58 - 62	74 73 - 76	< 0.10 < 0.10 - < 0.10
Ceriodaphnia dubia	Control	24.8 24.7 - 24.9	24.8 24.6 - 25.1	7.9 7.7 - 8.1	7.9 7.6 - 8.1	7.53 7.41 - 7.64	7.60 7.54 - 7.65	329 324 - 336	63 62 - 64	95 94 - 98	
	11.3%	24.8 24.7 - 24.9	25.0 24.8 - 25.2	7.8 7.6 - 8.1	7.9 7.6 - 8.1	7.54 7.46 - 7.60	7.60 7.54 - 7.66	304 299 - 314			
	22.6%	24.8 24.7 - 24.9	25.0 24.7 - 25.3	7.8 7.6 - 8.1	7.9 7.6 - 8.1	7.55 7.47 - 7.61	7.59 7.55 - 7.64	287 282 - 294			
	45.2%	24.8 24.7 - 25.0	25.0 24.8 - 25.3	7.9 7.7 - 8.2	7.9 7.7 - 8.2	7.55 7.47 - 7.60	7.59 7.54 - 7.64	255 252 - 258			
	72.6%	24.9 24.8 - 25.0	25.0 24.9 - 25.1	7.9 7.8 - 8.2	7.9 7.8 - 8.2	7.55 7.46 - 7.60	7.58 7.52 - 7.63	209 202 - 214			
	100.0%	24.9 24.8 - 25.1	24.9 24.7 - 25.1	7.9 7.8 - 8.2	7.9 7.8 - 8.2	7.54 7.46 - 7.58	7.57 7.51 - 7.61	167 162 - 169	61 60 - 62	68 67 - 69	< 0.10 < 0.10 - < 0.10
	Intake	24.9 24.8 - 25.1	25.0 24.8 - 25.3	8.0 7.8 - 8.3	7.9 7.7 - 8.2	7.54 7.47 - 7.59	7.55 7.46 - 7.60	166 160 - 171	61 58 - 62	74 73 - 76	< 0.10 < 0.10 - < 0.10

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.7	24.2	25.0
Ceriodaphnia dubia	24.9	24.6	25.3

PHYSICAL/CHEMICAL SUMMARY

Water Chemistry Mean Values and Ranges for *Pimephales promelas* Tests, UV-treated Sequoyah Nuclear Plant (SQN) Outfall 101 performed May 11 - 18, 2010.

Test	Sample ID	Temperature (°C)		Dissolved Oxygen (mg/L)		pH (S.U.)		Conductance	Alkalinity	Hardness
		Initial	Final	Initial	Final	Initial	Final	(µmhos/cm)	(mg/L $CaCO_3$)	(mg/L $CaCO_3$)
Pimephales promelas	Control	24.8 24.7 - 24.9	24.4 24.2 - 24.7	7.9 7.8 - 8.1	7.8 7.6 - 8.0	7.58 7.52 - 7.63	7.54 7.48 - 7.60	315 311 - 320	62 60 - 64	91 88 - 94
	11.3%	24.9 24.8 - 24.9	24.7 24.5 - 24.8	8.0 7.8 - 8.2	7.8 7.6 - 7.9	7.60 7.52 - 7.64	7.53 7.44 - 7.59	304 300 - 309		
	22.6%	24.9 24.8 - 25.0	24.6 24.4 - 24.8	8.0 7.9 - 8.2	7.8 7.7 - 8.0	7.59 7.52 - 7.64	7.53 7.44 - 7.60	285 274 - 296		
	45.2%	24.9 24.9 - 25.0	24.6 24.4 - 24.8	8.0 7.9 - 8.3	7.8 7.6 - 8.0	7.60 7.53 - 7.65	7.53 7.44 - 7.59	254 247 - 259		
	72.6%	24.9 24.9 - 25.0	24.6 24.5 - 24.7	8.1 7.9 - 8.3	7.8 7.6 - 8.0	7.59 7.51 - 7.63	7.52 7.44 - 7.58	212 208 - 219		
	100.0%	25.0 24.9 - 25.2	24.6 24.5 - 24.7	8.1 7.9 - 8.3	7.8 7.6 - 8.1	7.58 7.50 - 7.61	7.50 7.42 - 7.56	170 165 - 173	61 60 - 62	70 69 - 71
	Intake	25.0 24.8 - 25.2	24.6 24.3 - 24.8	8.1 7.8 - 8.3	7.8 7.6 - 8.1	7.57 7.50 - 7.62	7.52 7.44 - 7.56	165 159 - 167	61 59 - 62	68 67 - 69

Overall temperature (°C)	Average	Minimum	Maximum
Pimephales promelas	24.8	24.2	25.2

SUMMARY / CONCLUSIONS

Outfall 101 samples collected May 09 – 14, 2010, showed no toxic effects to fathead minnows or daphnids.

The resulting IC_{25} values, for both species, were > 100 percent.

Exposure of daphnids to intake samples resulted in no significant difference from the control during this study period.

Minnow growth in the intake samples was significantly lower than the control.

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

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1. *Pimephales promelas*

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

2. *Ceriodaphnia dubia*

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

DEVIATIONS / MODIFICATIONS TO TEST PROTOCOL

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

DEVIATIONS / MODIFICATIONS TO PRETEST CULTURE OR HOLDING OF TEST ORGANISMS

1. *Pimephales promelas*

   None

2. *Ceriodaphnia dubia*

   None

PHYSICAL AND CHEMICAL METHODS

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

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

3. Temperature was measured by SM 2550 B.

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

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

6. Conductance was measured by SM 2510 B.

7. Alkalinity was measured by SM 2320 B.

8. Total hardness was measured by SM 2340 C.

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

QUALITY ASSURANCE

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

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

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

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

3. Dilution Water Used: Moderately hard synthetic water.

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

REFERENCES

1. NPDES Permit No. TN0026450.

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

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

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

Sequoyah Nuclear Plant Biomonitoring
May 11 – 18, 2010

Appendix B

Diffuser Discharge Concentrations of Total Residual Chlorine,

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling, March 12, 1998 – May 14, 2010

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – May 14, 2010

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – May 14, 2010

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 – May 14, 2010

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

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 – May 14, 2010

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat
11/07/2004	-	<0.0187	0.000	0.014	-	-	-	-	-
11/08/2004	-	<0.0192	0.047	0.030	-	-	-	-	-
11/09/2004	-	<0.0233	0.048	0.016	-	-	0.041	-	-
11/10/2004	-	<0.0149	0.047	0.016	-	-	0.041	-	-
11/11/2004	-	<0.0149	0.049	0.017	-	-	0.043	-	-
11/12/2004	-	<0.0253	0.048	0.017	-	-	0.042	-	-
02/06/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/07/2005	-	<0.0116	0.028	0.010	-	-	-	0.007	-
02/08/2005	-	<0.0080	0.028	0.010	-	-	-	-	-
02/09/2005	-	0.0199	0.028	0.010	-	-	-	-	-
02/10/2005	-	<0.0042	0.028	0.010	-	-	-	-	-
02/11/2005	-	0.0155	0.028	0.010	-	-	-	0.007	-
06/05/2005	-	0.0063	-	-	-	-	-	-	-
06/06/2005	-	0.0043	-	-	-	-	-	-	0.037
06/07/2005	-	0.0103	-	-	-	-	-	-	0.037
06/08/2005	-	0.0295	-	-	-	-	-	-	0.037
06/09/2005	-	0.0129	-	-	-	-	-	-	-
06/10/2005	-	0.0184	-	-	-	-	-	-	-
07/17/2005	-	0.0109	0.026	0.009	-	-	-	-	-
07/18/2005	-	0.0150	0.026	0.009	-	-	-	-	0.036
07/19/2005	-	0.0163	0.026	0.009	-	-	-	-	0.036
07/20/2005	-	0.0209	0.026	0.009	-	-	-	0.014	0.036
07/21/2005	-	0.0242	0.026	0.009	-	-	-	-	-
07/22/2005	-	0.0238	0.054	0.018	-	-	-	0.014	-
10/30/2005	-	0.0068	-	-	-	-	-	-	-
10/31/2005	-	0.0112	-	-	-	-	-	-	-
11/01/2005	-	0.0104	-	-	-	-	-	-	0.035
11/02/2005	-	0.0104	-	-	-	-	-	-	0.036
11/03/2005	-	0.0117	-	-	-	-	-	-	0.036
11/04/2005	-	0.0165	-	-	-	-	-	-	0.035
11/14/2005	-	0.0274	-	-	-	-	-	-	-
11/15/2005	-	0.0256	-	-	-	-	-	-	-
11/16/2005	-	0.0234	-	-	-	-	-	-	-
11/17/2005	-	0.0231	-	-	-	-	-	-	-
11/18/2005	-	0.0200	-	-	-	-	-	-	-
11/19/2005	-	0.0116	-	-	-	-	-	-	-

Table B-1 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Mollusks, During Toxicity Test Sampling, March 12, 1998 – May 14, 2010

Date	Sodium Hypochlorite mg/L TRC	Towerbrom mg/L TRC	PCL-222 mg/L Phosphate	PCL-401 mg/L Copolymer	CL-363 mg/L DMAD	Cuprostat-PF mg/L Azole	H-130M mg/L Quat	Nalco 73551 mg/L EO/PO	H-150M mg/L Quat	MSW 101 mg/L Phosphate
11/12/2006	-	0.0055	-	-	-	-	-	-	-	-
11/13/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/14/2006	-	0.0143	-	-	-	-	-	-	0.037	-
11/15/2006	-	0.0068	-	-	-	-	-	-	0.037	-
11/16/2006	-	0.0267	-	-	-	-	-	-	0.037	-
11/17/2006	-	0.0222	-	-	-	-	-	-	-	-
11/26/2006	-	0.0188	-	-	-	-	-	-	-	-
11/27/2006	-	0.0138	-	-	-	-	-	-	-	-
11/28/2006	-	0.0120	-	-	-	-	-	-	-	-
11/29/2006	-	0.0288	-	-	-	-	-	-	-	-
11/30/2006	-	0.0376	-	-	-	-	-	-	-	-
12/01/2006	-	0.0187	-	-	-	-	-	-	-	-
05/28/07	-	-	-	-	-	-	-	-	-	0.015
05/29/07	-	-	-	-	-	-	-	-	0.036	0.015
05/30/07	-	0.0084	-	-	-	-	-	0.017	0.036	0.015
05/31/07	-	0.0103	-	-	-	-	-	-	0.036	0.015
06/01/07	-	0.0164	-	-	-	-	-	0.017	0.036	0.015
06/02/07	-	0.0305	-	-	-	-	-	-	-	0.015
12/02/07	-	0.0241	-	-	-	-	-	-	-	-
12/03/07	-	0.0128	-	-	-	-	-	-	-	-
12/04/07	-	0.0238	-	-	-	-	-	-	-	-
12/05/07	-	0.0158	-	-	-	-	-	-	-	-
12/06/07	-	0.0162	-	-	-	-	-	-	-	-
12/07/07	-	0.0175	-	-	-	-	-	-	-	
04/13/08	-	0.0039	-	-	-	-	-	-	-	-
04/14/08	-	0.0124	-	-	-	-	-	-	-	-
04/15/08	-	0.0229	-	-	-	-	-	-	-	-
04/16/08	-	0.0143	-	-	-	-	-	-	-	-
04/17/08	-	0.0120	-	-	-	-	-	-	-	-
04/18/08	-	0.0149	-	-	-	-	-	-	-	-
10/26/08	-	0.0260	-	-	-	-	-	-	-	-
10/27/08	-	0.0151	-	-	-	-	-	0.017	-	-
10/28/08	-	0.0172	-	-	-	-	-	-	0.041	-
10/29/08	-	0.0154	-	-	-	-	-	0.018	0.041	0.030
10/30/08	-	-	-	-	-	-	-	-	0.041	0.030
10/31/08	-	0.0086	-	-	-	-	-	-	0.041	0.030

Table B-1. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Microbiologically Induced Corrosion Mollusks, During Toxicity Test Sampling,
March 12, 1998 –May 14, 2010

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	Spectrus CT1300 mg/L Quat	H-150M mg/L Quat	MSW 101 mg/L Phosphate
02/08/09	-	0.0197	-	-	-	-	-	0.017	-	-	-
02/09/09	-	0.0237	-	-	-	-	-	0.017	-	-	-
02/10/09	-	0.0104	-	-	-	-	-	0.021	-	-	-
02/11/09	-	0.0155	-	-	-	-	-	0.017	-	-	-
02/12/09	-	0.0106	-	-	-	-	-	0.017	-	-	-
02/13/09	-	-	-	-	-	-	-	-	-	-	-
05/10/09	-	0.0129	-	-	-	-	-	-	-	-	-
05/11/09	-	0.0415	-	-	-	-	-	-	-	0.0446	-
05/12/09	-	0.0053	-	-	-	-	-	-	-	0.0396	-
05/13/09	-	0.0049	-	-	-	-	-	-	-	0.0396	-
05/14/09	-	<0.0141	-	-	-	-	-	-	-	0.0397	-
05/15/09	-	<0.0160	-	-	-	-	-	-	-	-	-
11/15/09	-	0.025	-	-	-	-	-	-	-	-	-
11/16/09	-	0.0152	-	-	-	-	-	-	-	-	-
11/17/09	-	0.0255	-	-	-	-	-	-	-	-	-
11/18/09	-	0.0306	-	-	-	-	-	-	-	-	-
11/19/09	-	0.0204	-	-	-	-	-	-	-	-	-
11/20/09	-	0.0093	-	-	-	-	-	-	-	-	-
05/09/10	-	0.0192	-	-	-	-	-	-	-	-	-
05/10/10	-	0.0055	-	-	-	-	-	-	-	-	-
05/11/10	-	0.0100	-	-	-	-	-	-	0.039	-	-
05/12/01	-	0.0171	-	-	-	-	-	-	0.039	-	-
05/13/10	-	0.0041	-	-	-	-	-	-	0.039	-	-
05/14/10	-	0.0099	-	-	-	-	-	-	0.039	-	-

Sequoyah Nuclear Plant Biomonitoring
May 11 – 18, 2010

Appendix C

Chain of Custody Records and
Toxicity Test Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Adam Deimling & John F. Lane

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (Specify): Express Courier

General Comments:
Adam Deimling :
John F. Lane :
Samples remained on ice throughout sampling and transport to lab. Dissolved Metals sample filtered and place on ice.

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project #6155 Laboratory Use				
		Date (mm/dd/yy)	Time (EST)			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time ET	Appearance
SQN-101-TOX A	Comp	05/09/10 – 05/10/10	0701 - 0601	1 (2.5gal)	1625.4			✓		100510.01	1.7°C	JL	1445	*
SQN-101-TOX B	Comp	05/09/10 – 05/10/10	0701 - 0601	1 (2.5gal)	1625.4			✓		~~100510.02~~	2.1°C	JL	1445	*
SQN-INT-TOX	Comp	05/09/10 – 05/10/10	0828 – 0728	1 (2.5 gal)	NA			✓		~~100510.03~~ 100510.02	0.9°C	JL	1445	*

Sample Custody – Fill In From Top Down

* CUSTODY SEALS INTACT. SAMPLES RECEIVED IN GOOD CONDITION. TRC ABSENT IN ALL SAMPLES.

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Adam Deimling	5/10/10 1040 ET	Express Courier B.R. Skiles	5-10-10- 10-40 ET
Express Courier B.R. Skiles	05-10-10 1445 ET	ETS	05-10-10 1445 ET

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 2 of 9

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Adam Deimling & John F. Lane

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:
Adam Deimling : [signature]
John F. Lane : [signature]
Samples remained on ice throughout sampling and transport to lab. Dissolved Metals sample filtered and place on ice.

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project #6155 Laboratory Use				
		Date (mm/dd/yy)	Time (EST)			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp (°C)	By	Time ET	Appearance
SQN-101-TOX A	Comp	05/11/10 – 05/12/10	0656 - 0556	1 (2.5gal)	1639.25				X	10051216	1.3 °C	JRS	1425	*
SQN-101-TOX B	Comp	05/11/10 – 05/12/10	0656 - 0556	1 (2.5gal)	1639.25				X	↓	1.4 °C	JRS	1425	*
SQN-INT-TOX	Comp	05/11/10 – 05/12/10	0713 - 0613	1 (2.5 gal)	NA				X	10051217	0.8 C	JRS	1425	*

Sample Custody – Fill In From Top Down

* CUSTODY SEALS INTACT. SAMPLES RECEIVED IN GOOD CONDITION. TRC ABSENT IN ALL SAMPLES [signature]

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Adam Deimling [signature]	5/12/10 0950 ET	Express Courier BR Skiles	5-12-10 0950 ET
Express Courier BR Skiles	05-12-10 1425 ET	ETS [signature]	05-12-10 1425 ET

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 2 of 9

Client: TVA

Project Name: Sequoyah NP Toxicity

P.O. Number: N/A

Facility Sampled: Sequoyah NP

NPDES Number: TN0026450

Collected By: Adam Deimling & John F. Lane

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

Delivered By (Circle One):

FedEx UPS Bus Client

Other (specify): Express Courier

General Comments:
Adam Deimling :
John F. Lane :

Samples remained on ice throughout sampling and transport to lab. Dissolved Metals sample filtered and place on ice.

Field Identification / Sample Description	Grab/Comp	Collection Date/Time		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Project # 6155 Laboratory Use				
		Date (mm/dd/yy)	Time (EST)			Yes	If Yes, Inches	No	Trace	ETS Log Number	Arrival Temp. (°C)	By	Time ET	Appearance
SQN-101-TOX A	Comp	05/13/10 – 05/14/10	0653 – 0553	1 (2.5gal)	1649.92			X		10051409	2.2 °C	JL	1425	*
SQN-101-TOX B	Comp	05/13/10 – 05/14/10	0653 – 0553	1 (2.5gal)	1649.92			X		↓	1.4 °C	JL	1425	*
SQN-INT-TOX	Comp	05/13/10 – 05/14/10	0711 - 0611	1 (2.5 gal)	NA			X		10094.10	2.2 °C	JL	1425	*

Sample Custody – Fill In From Top Down

* CUSTODY SEALS INTACT. SAMPLES RECEIVED IN GOOD CONDITION. TRC ABSENT IN ALL SAMPLES.

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
Adam Deimling	5/14/10 0745 ET	Express Courier B R Skiles	5-14-10 9:45 ET
Express Courier B R Skiles	05-14-10 1425 ET	ETS	05-14-10 1425 ET

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

ETS
Environmental Testing Solutions, Inc.

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

Species: ***Pimephales promelas***

Client: Tennessee Valley Authority
Facility: Sequoyah Nuclear Plant
NPDES #: TN0020168
Project #: 6155

County: Rhea
Outfall: 101

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

Test organism information:		*Test information:*		
Organism age:	19.87 HOURS OLD	Randomizing template:	Yellow	
Date and times organisms were born between:	05-10-10 1600	Incubator number and shelf location:	3C	
Organism source:	ATOX BATCH Pp 05-10-10	*Artemia* CHM number:	CHMS11	
		Drying information for weight determination:		
Transfer bowl information:	pH = 7.85 S.U. Temperature = 25.1°C	Date / Time in oven:	05-18-10	1150
		Initial oven temperature:	60°C	
Average transfer volume:	0.1344 ml	Date / Time out of oven:	05-19-10	1150
		Final oven temperature:	60°C	
		Total drying time:	24 HOURS	

Daily feeding and renewal information:

Day	Date	Morning feeding		Afternoon feeding		Test initiation, renewal, or termination		Sample numbers used		MHSW batch used
		Time	Analyst	Time	Analyst	Time	Analyst	Outfall 101	Intake	
0	05-11-10			1600		1152		100510.01	100510.02	05-09-10
1	05-12-10	0730		1330		1058		100510.01	100510.02	05-10-10
2	05-13-10	0730		1330		1056		100512.16	100512.17	05-10-10
3	05-14-10	0730		1330		1055		100512.16	100512.17	05-10-10
4	05-15-10	0730		1330		1056		100514.09	100514.10	05-13-10
5	05-16-10	0730		1330		1055		100514.09	100514.10	05-14-10
6	05-17-10	0730		1330		1057		100514.09	100514.10	05-14-10
7	05-18-10					1120				

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.934		NOEC	100%
Average weight per surviving larvae:	0.934	≥ 0.25mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 05-11-10

Survival and Growth Data

Day	CONTROL Non-treated				11.3%				22.6%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10 LGS	10	10 LSM	10 LSM	10	10
A = Pan weight (mg) Tray color code:: Magenta Analyst: [illegible] Date: 05.03.10	14.45	13.55	11.96	12.71	13.73	13.94	14.17	14.25	13.96	14.17	14.01	14.02
B = Pan + Larvae weight (mg) Analyst: LAB Date: 05.22.10	24.23	23.46	20.71	21.64	22.05	23.16	24.54	22.96	21.93	22.10	22.83	23.75
C = Larvae weight (mg) = B – A	9.78	9.91	8.75	8.93	8.32	9.22	10.37	8.71	7.97	7.93	8.82	9.73
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.978	0.991	0.875	0.893	0.832	0.922	1.037	0.871	0.797	0.793	0.882	0.973
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.934				0.916		2.0%		0.861		7.8%	

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:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 05-11-10

Survival and Growth Data

Day	45.2%				72.6%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10 (1SM)	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray color code:: Magenta Analyst: BLS Date: 05-03-10	13.37	15.69	14.03	13.59	13.71	15.07	14.58	13.57	14.36	14.19	13.59	14.44
B = Pan + Larvae weight (mg) Analyst: LAB Date: 05-22-10	20.75	24.79	22.55	22.47	22.30	23.62	24.42 ~~23.07~~ LG	23.07 ~~22.95~~ LG	22.95 ~~23.01~~ LG	23.01 ~~22.96~~ LG	22.86 ~~23.30~~ LG	23.30
C = Larvae weight (mg) = B – A	7.38	9.10	8.52	8.88	8.59	8.55	9.84	9.50	8.59	8.82	9.27	8.86
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.738	0.910	0.852	0.888	0.859	0.855	0.984	0.950	0.859	0.882	0.927	0.886
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.847		9.3%		0.912		2.4%		0.889		4.9%	

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

Calculations and data reviewed: [illegible]

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 05-11-10

Survival and Growth Data

Day	100% Intake											
	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
0	10	10	10	10								
1	10	10	10	10								
2	10	10	10	10								
3	10	10	10	10								
4	10	10	10	10								
5	10	10	10	10								
6	10	10	10	10								
7 ORGANISMS APPEAR SMALLER IN THE INTAKE.	10	10	10	10								
A = Pan weight (mg) Tray color code:: Magenta Analyst: MS Date: 05-03-10	14.82	13.16	14.17	16.16								
B = Pan + Larvae weight (mg) Analyst: LAB Date: 05-22-10	22.36	20.41	20.86	23.73								
C = Larvae weight (mg) = B – A	7.54	7.25	6.69	7.57								
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.754	0.725	0.669	0.757								
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.726		22.3%									

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: JH

Comments:

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 11 - 18, 2010

Environmental Testing Solutions, Inc.

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

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

Project number: 6155
Reveiwed by: [signature]

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	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	14.45	24.23	9.78	0.978	0.934	6.3	0.978	100.0	0.934	6.3	Not applicable
	B	10	10	13.55	23.46	9.91	0.991			0.991				
	C	10	10	11.96	20.71	8.75	0.875			0.875				
	D	10	10	12.71	21.64	8.93	0.893			0.893				
11.3%	E	10	10	13.73	22.05	8.32	0.832	0.916	9.7	0.832	100.0	0.916	9.7	2.0
	F	10	10	13.94	23.16	9.22	0.922			0.922				
	G	10	10	14.17	24.54	10.37	1.037			1.037				
	H	10	10	14.25	22.96	8.71	0.871			0.871				
22.6%	I	10	10	13.96	21.93	7.97	0.797	0.861	9.9	0.797	100.0	0.861	9.9	7.8
	J	10	10	14.17	22.10	7.93	0.793			0.793				
	K	10	10	14.01	22.83	8.82	0.882			0.882				
	L	10	10	14.02	23.75	9.73	0.973			0.973				
45.2%	M	10	10	13.37	20.75	7.38	0.738	0.847	9.0	0.738	100.0	0.847	9.0	9.3
	N	10	10	15.69	24.79	9.10	0.910			0.910				
	O	10	10	14.03	22.55	8.52	0.852			0.852				
	P	10	10	13.59	22.47	8.88	0.888			0.888				
72.6%	Q	10	10	13.71	22.30	8.59	0.859	0.912	7.1	0.859	100.0	0.912	7.1	2.4
	R	10	10	15.07	23.62	8.55	0.855			0.855				
	S	10	10	14.58	24.42	9.84	0.984			0.984				
	T	10	10	13.57	23.07	9.50	0.950			0.950				
100%	U	10	10	14.36	22.95	8.59	0.859	0.889	3.2	0.859	100.0	0.889	3.2	4.9
	V	10	10	14.19	23.01	8.82	0.882			0.882				
	W	10	10	13.59	22.86	9.27	0.927			0.927				
	X	10	10	14.44	23.30	8.86	0.886			0.886				
100% Intake	Y	10	10	14.82	22.36	7.54	0.754	0.726	5.6	0.754	100.0	0.726	5.6	22.3
	Z	10	10	13.16	20.41	7.25	0.725			0.725				
	AA	10	10	14.17	20.86	6.69	0.669			0.669				
	BB	10	10	16.16	23.73	7.57	0.757			0.757				

Outfall 101:
Dunnett's MSD value: 0.1195
PMSD: 12.8

Intake:
Dunnett's MSD value: 0.0695
PMSD: 7.4

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

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

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

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

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 11 - 18, 2010
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/11/2010	Test ID:	PpFRCR	Sample ID:	**TVA / SQN101**
End Date:	5/18/2010	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
Control	0.9780	0.9910	0.8750	0.8930
11.3	0.8320	0.9220	1.0370	0.8710
22.6	0.7970	0.7930	0.8820	0.9730
45.2	0.7380	0.9100	0.8520	0.8880
72.6	0.8590	0.8550	0.9840	0.9500
100	0.8590	0.8820	0.9270	0.8860
Intake	0.7540	0.7250	0.6690	0.7570

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Control	0.9343	1.0000	0.9343	0.8750	0.9910	6.286	4				0.9343	1.0000
11.3	0.9155	0.9799	0.9155	0.8320	1.0370	9.720	4	0.378	2.410	0.1195	0.9155	0.9799
22.6	0.8613	0.9219	0.8613	0.7930	0.9730	9.876	4	1.473	2.410	0.1195	0.8772	0.9389
45.2	0.8470	0.9066	0.8470	0.7380	0.9100	9.032	4	1.760	2.410	0.1195	0.8772	0.9389
72.6	0.9120	0.9762	0.9120	0.8550	0.9840	7.130	4	0.449	2.410	0.1195	0.8772	0.9389
100	0.8885	0.9510	0.8885	0.8590	0.9270	3.184	4	0.923	2.410	0.1195	0.8772	0.9389
Intake	0.7263	0.7774	0.7263	0.6690	0.7570	5.618	4					

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96793216	0.884	0.215280069	-0.7446185
Bartlett's Test indicates equal variances (p = 0.64)	3.40016365	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	**100**	**>100**		1	0.11945887	0.12786607	0.00457047	0.00491397	0.48466599	5, 18
Treatments vs Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	19.547			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	**>100**			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
Non-treated
May 11 - 18, 2010

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/11/2010	Test ID:	PpFRCR	Sample ID:	**TVA / SQN101, Intake**
End Date:	5/18/2010	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	Non-treated				

Conc-%	1	2	3	4
Control	0.9780	0.9910	0.8750	0.8930
11.3	0.8320	0.9220	1.0370	0.8710
22.6	0.7970	0.7930	0.8820	0.9730
45.2	0.7380	0.9100	0.8520	0.8880
72.6	0.8590	0.8550	0.9840	0.9500
100	0.8590	0.8820	0.9270	0.8860
Intake	0.7540	0.7250	0.6690	0.7570

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.9343	1.0000	0.9343	0.8750	0.9910	6.286	4			
11.3	0.9155	0.9799	0.9155	0.8320	1.0370	9.720	4			
22.6	0.8613	0.9219	0.8613	0.7930	0.9730	9.876	4			
45.2	0.8470	0.9066	0.8470	0.7380	0.9100	9.032	4			
72.6	0.9120	0.9762	0.9120	0.8550	0.9840	7.130	4			
100	0.8885	0.9510	0.8885	0.8590	0.9270	3.184	4			
*Intake	0.7263	0.7774	0.7263	0.6690	0.7570	5.618	4	5.817	1.943	0.0695

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.88218808	0.749	-0.2763905	-1.9388544
F-Test indicates equal variances (p = 0.57)	2.0715251	47.4672279		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences Treatments vs Control	0.06947945	0.07436923	0.086528	0.00255692	0.00113375	1, 6

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
May 11 - 18, 2010

ETS
Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Project number: 6155
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)	7.58	7.58	7.46	7.53	7.43	7.57	7.41	7.56	7.61	7.60	7.59	7.51	7.64	7.61
	DO (mg/L)	7.8	7.8	7.8	7.8	7.9	7.6	7.9	7.7	7.7	8.0	8.1	8.1	7.8	7.9
	Conductivity (µmhos/cm)	326		327		325		324		332		336		336	
	Alkalinity (mg/L $CaCO_3$)	64		62						64		62			
	Hardness (mg/L $CaCO_3$)	98		94						94		94			
	Temperature (°C)	24.8	24.6	24.6	24.5	24.7	24.4	24.7	24.7	24.7	24.5	24.7	24.2	24.8	24.6
11.3%	pH (SU)	7.54	7.57	7.59	7.49	7.54	7.57	7.46	7.54	7.53	7.59	7.60	7.51	7.50	7.63
	DO (mg/L)	7.8	7.8	8.0	7.8	7.9	7.6	7.8	7.6	7.6	8.0	8.1	8.0	7.6	7.6
	Conductivity (µmhos/cm)	301		302		299		299		308		308		314	
	Temperature (°C)	24.7	24.6	24.7	24.5	24.7	24.7	24.7	24.4	24.7	24.4	24.7	24.7	24.9	24.4
22.6%	pH (SU)	7.56	7.54	7.60	7.50	7.55	7.53	7.47	7.55	7.56	7.56	7.61	7.50	7.51	7.63
	DO (mg/L)	7.8	7.8	8.0	7.8	7.9	7.6	7.8	7.7	7.7	7.9	8.1	8.0	7.6	7.6
	Conductivity (µmhos/cm)	284		285		284		282		290		292		294	
	Temperature (°C)	24.8	24.5	24.7	24.3	24.8	24.7	24.8	24.8	24.8	24.5	24.8	24.7	24.9	24.4
45.2%	pH (SU)	7.56	7.53	7.60	7.50	7.57	7.50	7.47	7.56	7.56	7.56	7.59	7.50	7.52	7.63
	DO (mg/L)	7.8	7.8	8.0	7.8	8.0	7.7	7.8	7.6	7.8	7.9	8.2	8.1	7.7	7.7
	Conductivity (µmhos/cm)	253		256		253		252		256		257		258	
	Temperature (°C)	24.8	24.5	24.7	24.3	24.9	24.9	24.8	24.8	24.8	24.2	24.8	24.7	24.9	24.5
72.6%	pH (SU)	7.56	7.51	7.58	7.49	7.55	7.49	7.46	7.54	7.56	7.56	7.60	7.48	7.51	7.61
	DO (mg/L)	7.8	7.8	8.0	7.8	8.0	7.7	7.8	7.7	7.8	8.1	8.2	8.1	7.8	7.7
	Conductivity (µmhos/cm)	210		213		206		202		206		212		214	
	Temperature (°C)	24.9	24.7	24.7	24.6	24.9	24.6	24.8	24.7	24.8	24.3	24.8	24.6	24.9	24.5
100%	pH (SU)	7.55	7.53	7.58	7.46	7.54	7.49	7.46	7.52	7.55	7.56	7.57	7.46	7.52	7.59
	DO (mg/L)	7.8	7.8	8.0	7.8	8.0	7.8	7.8	7.6	7.8	8.1	8.2	8.1	7.9	7.8
	Conductivity (µmhos/cm)	166		169		167		162		166		168		169	
	Alkalinity (mg/L $CaCO_3$)	62				62				60					
	Hardness (mg/L $CaCO_3$)	69				67				69					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.4	24.8	24.7	25.0	24.6	24.8	24.5	24.8	24.3	24.8	24.5	25.0	24.6
100% Intake	pH (SU)	7.55	7.53	7.59	7.45	7.51	7.49	7.47	7.53	7.57	7.53	7.57	7.48	7.52	7.58
	DO (mg/L)	7.8	7.8	8.0	7.8	8.1	7.8	7.9	7.6	7.9	8.0	8.3	8.1	8.0	7.8
	Conductivity (µmhos/cm)	164		171		162		160		168		168		171	
	Alkalinity (mg/L $CaCO_3$)	62				58				62					
	Hardness (mg/L $CaCO_3$)	73				76				73					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.0	24.4	25.0	24.5	24.9	24.5	24.7	24.6	24.7	24.3	24.6	24.5	25.0	24.6

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** **Date:** 05-11-10
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated**
Daily Chemistry:

		Day					
		0		1		2	
	Analyst	BCB	BCB	BCB	BCB	BCB	BCB
Concentration	Parameter						
CONTROL Non-treated	pH (S.U.)	7.58	7.58	7.46	7.53	7.43	7.57
	DO (mg/L)	7.8	7.8	7.8	7.8	7.9	7.6
	Conductivity (µmhos/cm)	326		327		325	
	Alkalinity (mg $CaCO_3$/L)	64		62			
	Hardness (mg $CaCO_3$/L)	98		94			
	Temperature (°C)	24.8	24.6	24.6	24.5	24.7	24.4
11.3%	pH (S.U.)	7.54	7.57	7.59	7.49	7.54	7.57
	DO (mg/L)	7.8	7.8	8.0	7.8	7.9	7.6
	Conductivity (µmhos/cm)	301		302		299	
	Temperature (°C)	24.7	24.6	24.7	24.5	24.7	24.7
22.6%	pH (S.U.)	7.56	7.54	7.60	7.50	7.55	7.53
	DO (mg/L)	7.8	7.8	8.0	7.8	7.9	7.6
	Conductivity (µmhos/cm)	284		285		284	
	Temperature (°C)	24.8	24.5	24.7	24.3	24.8	24.7
45.2%	pH (S.U.)	7.56	7.53	7.60	7.50	7.57	7.50
	DO (mg/L)	7.8	7.8	8.0	7.8	8.0	7.7
	Conductivity (µmhos/cm)	253		256		253	
	Temperature (°C)	24.8	24.5	24.7	24.3	24.9	24.9
72.6%	pH (S.U.)	7.56	7.51	7.58	7.49	7.55	7.49
	DO (mg/L)	7.8	7.8	8.0	7.8	8.0	7.7
	Conductivity (µmhos/cm)	210		213		206	
	Temperature (°C)	24.9	24.7	24.7	24.6	24.9	24.6
100%	pH (S.U.)	7.55	7.53	7.58	7.46	7.54	7.49
	DO (mg/L)	7.8	7.8	8.0	7.8	8.0	7.8
	Conductivity (µmhos/cm)	166		169		167	
	Alkalinity (mg $CaCO_3$/L)	62				62	
	Hardness (mg $CaCO_3$/L)	69				67	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.4	24.8	24.7	25.0	24.6
100% Intake	pH (S.U.)	7.55	7.53	7.59	7.45	7.51	7.49
	DO (mg/L)	7.8	7.8	8.0	7.8	8.1	7.8
	Conductivity (µmhos/cm)	164		171		162	
	Alkalinity (mg $CaCO_3$/L)	62				58	
	Hardness (mg $CaCO_3$/L)	73				76	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.4	25.0	24.5	24.9	24.5
		Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, Non-treated** **Date:** 05-11-10

		Day							
		3		4		5		6	
	Analyst	KOL	LAB	LAB	BSL	BSL	BCS	BCS	BCS
Concen-tration	Parameter								
CONTROL Non-treated	pH (S.U.)	7.41	7.56	7.61	7.60	7.59	7.51	7.64	7.61
	DO (mg/L)	7.9	7.7	7.7	8.0	8.1	8.1	7.8	7.9
	Conductivity (µmhos/cm)	324		332		336		336	
	Alkalinity (mg $CaCO_3$/L)			64		62			
	Hardness (mg $CaCO_3$/L)			94		94			
	Temperature (°C)	24.7	24.7	24.7	24.5	24.7	24.2	24.8	24.6
11.3%	pH (S.U.)	7.46	7.54	7.53	7.59	7.60	7.51	7.50	7.63
	DO (mg/L)	7.8	7.6	7.6	8.0	8.1	8.0	7.6	7.6
	Conductivity (µmhos/cm)	299		308		308		314	
	Temperature (°C)	24.7	24.4	24.7	24.4	24.7	24.7	24.9	24.4
22.6%	pH (S.U.)	7.47	7.55	7.56	7.56	7.61	7.50	7.51	7.63
	DO (mg/L)	7.8	7.7	7.7	7.9	8.1	8.0	7.6	7.6
	Conductivity (µmhos/cm)	282		290		292		294	
	Temperature (°C)	24.8	24.8	24.8	24.5	24.8	24.7	24.9	24.4
45.2%	pH (S.U.)	7.47	7.56	7.56	7.56	7.59	7.50	7.52	7.63
	DO (mg/L)	7.8	7.6	7.8	7.9	8.2	8.1	7.7	7.7
	Conductivity (µmhos/cm)	252		256		257		258	
	Temperature (°C)	24.8	24.8	24.8	24.2	24.8	24.7	24.9	24.5
72.6%	pH (S.U.)	7.46	7.54	7.56	7.56	7.60	7.48	7.51	7.61
	DO (mg/L)	7.8	7.7	7.8	8.1	8.2	8.1	7.8	7.7
	Conductivity (µmhos/cm)	202		206		212		214	
	Temperature (°C)	24.8	24.7	24.8	24.3	24.8	24.6	24.9	24.5
100%	pH (S.U.)	7.46	7.52	7.55	7.56	7.57	7.46	7.52	7.59
	DO (mg/L)	7.8	7.6	7.8	8.1	8.2	8.1	7.9	7.8
	Conductivity (µmhos/cm)	162		166		168		169	
	Alkalinity (mg $CaCO_3$/L)			60					
	Hardness (mg $CaCO_3$/L)			69					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.5	24.8	24.3	24.8	24.5	25.0	24.6
100% Intake	pH (S.U.)	7.47	7.53	7.57	7.53	7.57	7.48	7.52	7.58
	DO (mg/L)	7.9	7.6	7.9	8.0	8.3	8.1	8.0	7.8
	Conductivity (µmhos/cm)	160		168		168		171	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			73					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.7	24.6	24.7	24.3	24.6	24.5	25.0	24.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

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

Client: Tennessee Valley Authority
Facility: Sequoyah Nuclear Plant
NPDES #: TN0026450
Project #: 6155

County: Hamilton
Outfall: 101

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

Test organism source information:											*Test information:*	
Organism age:	< 24-hours old										Randomizing template color:	GREEN
Date and times organisms were born between:	05-11-10 0630 TO 1255										Incubator number and shelf location:	2C2
Culture board:	05-04-10 B											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	04-08-10
Culture board cup number:	5	8	14	15	16	17	18	20	23	30		
Transfer vessel information:	pH = 7.92 S.U. Temperature = 25.0 °C										*Selenastrum* batch:	04-30-10
Average transfer volume (mL):	0.0263 mL											

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Sample numbers used Outfall 101	Sample numbers used Intake	Analyst
0	05-11-10	1329	05-09-10	100510.01	100510.02	JH
1	05-12-10	1230	05-10-10	100510.01	100510.02	JH
2	05-13-10	1233	05-10-10	100512.16	100512.17	JH
3	05-14-10	1232	05-10-10	100512.16	100512.17	JH
4	05-15-10	1233	05-13-10	100514.09	100514.10	JH
5	05-16-10	1231	05-14-10	100514.09	100514.10	JH
6	05-17-10	1234	05-14-10	100514.09	100514.10	JH
7	05-18-10	1250				JH

Control information:	Control-1	Control-2	Acceptance criteria	*Summary of test endpoints:*	
% of Male Adults:	0%	0%	≤ 20%	7-day LC_{50}	>100%
% Adults having 3rd Broods:	100%	100%	≥ 80%	NOEC	100%
% Mortality:	0%	0%	≤ 20%	LOEC	>100%
Mean Offspring/Female:	28.8	29.5	≥ 15.0 offspring/female	ChV	>100%
% CV:	4.97%	4.97%	< 40.0 %	IC_{25}	>100%

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101** **Date:** 05-11-10

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	5	3	4	4	3	3	3	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	9	9	11	10	10	12	10	9	11	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	16	15	13	14	16	15	15	14	12
Total young produced		30	28	30	27	27	31	28	29	30	28
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L
X for 3rd Broods		X	X	X	X	X	X	X	X	X	X

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.8

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

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	4	4	3	4	5	5	4	5	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	11	11	12	10	13	10	12	11	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	19	15	15	18	15	17	13	15	16
Total young produced		30	34	29	31	33	33	31	30	30	32
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.3
% Reduction from Control-1:	-8.7%

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia***
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 **Date:** 05-11-10

CONC: **22.6%** ***Survival and Reproduction Data***

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

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	32.4
% Reduction from Control-1:	-12.5%

CONC: **45.2%** ***Survival and Reproduction Data***

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	4	4	5	5	4	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	10	12	13	10	11	11	11	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	17	20	18	16	16	19	18	15	19	14
Total young produced		34	36	32	33	34	33	34	31	35	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	33.2
% Reduction from Control-1:	-15.3%

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 **Date:** 05-11-10
CONC: 72.6% ***Survival and Reproduction Data***

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	6	4	4	5	4	4	5	5	5	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	13	10	12	11	12	13	10	12	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	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	20	17	18	18	17	20	16	19	18	18
Total young produced		39	31	34	34	33	37	31	36	35	34
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.4
% Reduction from Control-1:	-19.4%

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	6	4	5	7	5	5	4	4	4	5
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	14	11	12	13	12	13	13	11	13
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	19	21	19	20	18	15	17	17	17	19
Total young produced		36	39	35	39	36	32	34	34	32	37
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	35.4
% Reduction from Control-1:	-22.9%

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 Date: 03-11-10

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	3	4	4	5	4	4	3	3	3	3
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	11	10	11	11	12	11	13	11	11	11
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	16	13	16	16	14	15	12	15	15	15
Total young produced		30	27	31	32	30	30	28	29	29	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), SB = split brood (single brood split between two days), CO = carry over (offspring carried over with adult during transfer).

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

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

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

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	34.8
% Reduction from Control-2:	-18.0%

ETS
Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
May 11 - 18, 2010
Verification of *Ceriodaphnia* Reproduction Totals

Control-1

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	3	4	4	3	3	3	5	5	5	40
5	9	9	11	10	10	12	10	9	11	11	102
6	0	0	0	0	0	0	0	0	0	0	0
7	16	16	15	13	14	16	15	15	14	12	146
Total	**30**	**28**	**30**	**27**	**27**	**31**	**28**	**29**	**30**	**28**	**288**

72.6%

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	4	4	5	4	4	5	5	5	5	47
5	13	10	12	11	12	13	10	12	12	11	116
6	0	0	0	0	0	0	0	0	0	0	0
7	20	17	18	18	17	20	16	19	18	18	181
Total	**39**	**31**	**34**	**34**	**33**	**37**	**31**	**36**	**35**	**34**	**344**

11.3%

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
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	5	5	4	5	4	4	42
5	10	11	11	12	10	13	10	12	11	12	112
6	0	0	0	0	0	0	0	0	0	0	0
7	16	19	15	15	18	15	17	13	15	16	159
Total	**30**	**34**	**29**	**31**	**33**	**33**	**31**	**30**	**30**	**32**	**313**

100%

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	4	5	7	5	5	4	4	4	5	49
5	11	14	11	12	13	12	13	13	11	13	123
6	0	0	0	0	0	0	0	0	0	0	0
7	19	21	19	20	18	15	17	17	17	19	182
Total	**36**	**39**	**35**	**39**	**36**	**32**	**34**	**34**	**32**	**37**	**354**

22.6%

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	4	5	4	6	4	4	4	4	4	4	43
5	12	10	13	10	11	11	11	11	11	13	113
6	0	0	0	0	0	0	0	0	0	0	0
7	17	15	17	18	16	17	19	15	15	19	168
Total	**33**	**30**	**34**	**34**	**31**	**32**	**34**	**30**	**30**	**36**	**324**

Control-2

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	3	4	4	5	4	4	3	3	3	3	36
5	11	10	11	11	12	11	13	11	11	11	112
6	0	0	0	0	0	0	0	0	0	0	0
7	16	13	16	16	14	15	12	15	15	15	147
Total	**30**	**27**	**31**	**32**	**30**	**30**	**28**	**29**	**29**	**29**	**295**

45.2%

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	5	4	4	5	5	4	5	5	5	5	47
5	12	12	10	12	13	10	11	11	11	11	113
6	0	0	0	0	0	0	0	0	0	0	0
7	17	20	18	16	16	19	18	15	19	14	172
Total	**34**	**36**	**32**	**33**	**34**	**33**	**34**	**31**	**35**	**30**	**332**

100% Intake

Day	Replicate number 1	2	3	4	5	6	7	8	9	10	Total
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0
4	6	4	4	5	4	4	5	5	5	4	46
5	14	12	11	15	12	14	13	13	13	14	131
6	0	0	0	0	0	0	0	0	0	0	0
7	17	17	18	14	18	16	19	15	18	19	171
Total	**37**	**33**	**33**	**34**	**34**	**34**	**37**	**33**	**36**	**37**	**348**

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 11 - 18, 2010

ETS
Environmental Testing Solutions, Inc.

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

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

Project number: 6155

Reveiwed by: Yunner

Concentration (%)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control - 1	30	28	30	27	27	31	28	29	30	28	100	28.8	4.9	Not applicable
11.3%	30	34	29	31	33	33	31	30	30	32	100	31.3	5.2	-8.7
22.6%	33	30	34	34	31	32	34	30	30	36	100	32.4	6.5	-12.5
45.2%	34	36	32	33	34	33	34	31	35	30	100	33.2	5.5	-15.3
72.6%	39	31	34	34	33	37	31	36	35	34	100	34.4	7.3	-19.4
100%	36	39	35	39	36	32	34	34	32	37	100	35.4	7.1	-22.9
Control - 2	30	27	31	32	30	30	28	29	29	29	100	29.5	4.9	Not applicable
100% Intake	37	33	33	34	34	34	37	33	36	37	100	34.8	5.0	-18.0

Outfall 101:
Dunnett's MSD value: 2.085
PMSD: 7.2

Intake:
Dunnett's MSD value: 1.241
PMSD: 4.2

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.

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

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

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

TVA / Sequoyah Nuclear Plant, Outfall 101
Non-treated
May 11 - 18, 2010
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/11/2010	Test ID:	CdFRCR	Sample ID:	TVA / SQN101
End Date:	5/18/2010	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
Control-1	30.000	28.000	30.000	27.000	27.000	31.000	28.000	29.000	30.000	28.000
Control-2	30.000	27.000	31.000	32.000	30.000	30.000	28.000	29.000	29.000	29.000
11.3	30.000	34.000	29.000	31.000	33.000	33.000	31.000	30.000	30.000	32.000
22.6	33.000	30.000	34.000	34.000	31.000	32.000	34.000	30.000	30.000	36.000
45.2	34.000	36.000	32.000	33.000	34.000	33.000	34.000	31.000	35.000	30.000
72.6	39.000	31.000	34.000	34.000	33.000	37.000	31.000	36.000	35.000	34.000
100	36.000	39.000	35.000	39.000	36.000	32.000	34.000	34.000	32.000	37.000
Intake	37.000	33.000	33.000	34.000	34.000	34.000	37.000	33.000	36.000	37.000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Control-1	28.800	0.9763	28.800	27.000	31.000	4.856	10				32.583	1.0000
Control-2	29.500	1.0000	29.500	27.000	32.000	4.860	10					
11.3	31.300	1.0610	31.300	29.000	34.000	5.228	10	-2.742	2.287	2.085	32.583	1.0000
22.6	32.400	1.0983	32.400	30.000	36.000	6.539	10	-3.948	2.287	2.085	32.583	1.0000
45.2	33.200	1.1254	33.200	30.000	36.000	5.462	10	-4.825	2.287	2.085	32.583	1.0000
72.6	34.400	1.1661	34.400	31.000	39.000	7.277	10	-6.141	2.287	2.085	32.583	1.0000
100	35.400	1.2000	35.400	32.000	39.000	7.072	10	-7.238	2.287	2.085	32.583	1.0000
Intake	34.800	1.1797	34.800	33.000	37.000	5.032	10					

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.581877172	1.035	0.151372592	-0.51208247
Bartlett's Test indicates equal variances (p = 0.47)	4.581434727	15.08627224		
The control means are not significantly different (p = 0.28)	1.105263158	2.100922029		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	**100**	**>100**		1	2.085110834	0.072399682	55.21666667	4.157407407	1.9E-08	5, 54
Treatments vs Control-1										

Linear Interpolation (200 Resamples)

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

TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
Non-treated
May 11 - 18, 2010

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/11/2010	Test ID:	CdFRCR	Sample ID:	**TVA / SQN101, Intake**
End Date:	5/18/2010	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
Control-1	30.000	28.000	30.000	27.000	27.000	31.000	28.000	29.000	30.000	28.000
Control-2	30.000	27.000	31.000	32.000	30.000	30.000	28.000	29.000	29.000	29.000
11.3	30.000	34.000	29.000	31.000	33.000	33.000	31.000	30.000	30.000	32.000
22.6	33.000	30.000	34.000	34.000	31.000	32.000	34.000	30.000	30.000	36.000
45.2	34.000	36.000	32.000	33.000	34.000	33.000	34.000	31.000	35.000	30.000
72.6	39.000	31.000	34.000	34.000	33.000	37.000	31.000	36.000	35.000	34.000
100	36.000	39.000	35.000	39.000	36.000	32.000	34.000	34.000	32.000	37.000
Intake	37.000	33.000	33.000	34.000	34.000	34.000	37.000	33.000	36.000	37.000

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control-1	28.800	0.9763	28.800	27.000	31.000	4.856	10			
Control-2	29.500	1.0000	29.500	27.000	32.000	4.860	10			
11.3	31.300	1.0610	31.300	29.000	34.000	5.228	10			
22.6	32.400	1.0983	32.400	30.000	36.000	6.539	10			
45.2	33.200	1.1254	33.200	30.000	36.000	5.462	10			
72.6	34.400	1.1661	34.400	31.000	39.000	7.277	10			
100	35.400	1.2000	35.400	32.000	39.000	7.072	10			
Intake	34.800	1.1797	34.800	33.000	37.000	5.032	10	-7.405	1.734	1.241

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93073082	0.868	0.22652909	-1.16236167
F-Test indicates equal variances (p = 0.56)	1.491891861	6.541089535		
The control means are not significantly different (p = 0.28)	1.105263158	2.100922029		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs Control-2	1.241064166	0.042069972	140.45	2.561111111	7.2E-07	1, 18

TVA / Sequoyah Nuclear Plant, Outfall 101 - Non-treated
May 11 - 18, 2010

ETS
Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Project number: 6155
Reviewed by: [signature]

Concentration	Parameter	Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Control	pH (SU)	7.58	7.61	7.46	7.54	7.43	7.60	7.41	7.61	7.61	7.65	7.59	7.56	7.64	7.64
	DO (mg/L)	7.8	7.9	7.8	7.8	7.9	7.6	7.9	7.8	7.7	8.1	8.1	8.0	7.8	7.9
	Conductivity (µmhos/cm)	326		327		325		324		332		336		336	
	Alkalinity (mg/L $CaCO_3$)	64		62						64		62			
	Hardness (mg/L $CaCO_3$)	98		94						94		94			
	Temperature (°C)	24.8	24.9	24.9	24.9	24.8	24.6	24.8	24.8	24.7	24.8	24.8	25.1	24.8	24.8
11.3%	pH (SU)	7.54	7.60	7.59	7.56	7.54	7.60	7.46	7.60	7.53	7.66	7.60	7.54	7.50	7.64
	DO (mg/L)	7.8	7.9	8.0	7.9	7.9	7.7	7.8	7.6	7.6	8.1	8.1	8.0	7.6	7.8
	Conductivity (µmhos/cm)	301		302		299		299		308		308		314	
	Temperature (°C)	24.9	25.2	24.9	25.2	24.8	24.8	24.8	25.0	24.7	25.0	24.7	25.1	24.9	24.9
22.6%	pH (SU)	7.56	7.60	7.60	7.56	7.55	7.60	7.47	7.59	7.56	7.64	7.61	7.55	7.51	7.62
	DO (mg/L)	7.8	7.9	8.0	7.9	7.9	7.7	7.8	7.6	7.7	8.1	8.1	8.0	7.6	7.8
	Conductivity (µmhos/cm)	284		285		284		282		290		292		294	
	Temperature (°C)	24.9	25.2	24.9	25.3	24.8	24.8	24.8	25.0	24.8	24.9	24.7	24.8	24.9	24.7
45.2%	pH (SU)	7.56	7.58	7.60	7.55	7.57	7.60	7.47	7.59	7.56	7.64	7.59	7.54	7.52	7.62
	DO (mg/L)	7.8	7.8	8.0	7.9	8.0	7.8	7.8	7.7	7.8	8.2	8.2	8.0	7.7	7.8
	Conductivity (µmhos/cm)	253		256		253		252		256		257		258	
	Temperature (°C)	25.0	25.0	24.9	25.1	24.8	25.0	24.8	24.9	24.8	24.8	24.7	25.3	24.9	24.9
72.6%	pH (SU)	7.56	7.59	7.58	7.56	7.55	7.58	7.46	7.59	7.56	7.63	7.60	7.52	7.51	7.62
	DO (mg/L)	7.8	7.8	8.0	7.9	8.0	7.8	7.8	7.8	7.8	8.2	8.2	8.1	7.8	7.8
	Conductivity (µmhos/cm)	210		213		206		202		206		212		214	
	Temperature (°C)	25.0	25.0	24.8	25.1	24.8	24.9	24.9	24.9	24.8	24.9	24.8	25.0	24.9	24.9
100%	pH (SU)	7.55	7.58	7.58	7.54	7.54	7.58	7.46	7.58	7.55	7.61	7.57	7.51	7.52	7.61
	DO (mg/L)	7.8	7.8	8.0	7.9	8.0	7.8	7.8	7.8	7.8	8.2	8.2	8.1	7.9	7.8
	Conductivity (µmhos/cm)	166		169		167		162		166		168		169	
	Alkalinity (mg/L $CaCO_3$)	62				62				60					
	Hardness (mg/L $CaCO_3$)	69				67				69					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	25.1	24.8	24.9	25.0	24.9	24.9	24.9	24.9	24.7	24.8	25.1	25.1	25.0
100% Intake	pH (SU)	7.55	7.57	7.59	7.54	7.51	7.46	7.47	7.56	7.57	7.60	7.57	7.51	7.52	7.60
	DO (mg/L)	7.8	7.8	8.0	7.9	8.1	7.7	7.9	7.7	7.9	8.2	8.3	8.1	8.0	7.8
	Conductivity (µmhos/cm)	164		171		162		160		168		168		171	
	Alkalinity (mg/L $CaCO_3$)	62				58				62					
	Hardness (mg/L $CaCO_3$)	73				76				73					
	Total Residual Chlorine (mg/L)	<0.10				<0.10				<0.10					
	Temperature (°C)	25.1	25.3	25.0	24.9	25.1	25.1	24.9	24.8	24.9	25.0	24.8	25.0	24.8	25.0

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **Date:** 05-11-10

Client: **TVA / Sequoyah Nuclear Plant, Outfall 101**

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	[illegible]	BCS	BCS	BCS	BCS	BCS
Concentration	Parameter						
CONTROL	pH (S.U.)	7.56	7.61	7.46	7.54	7.43	7.60
	DO (mg/L)	7.8	7.9	7.8	7.8	7.9	7.6
	Conductivity (µmhos/cm)	326		327		325	
	Alkalinity (mg $CaCO_3$/L)	44		62			
	Hardness (mg $CaCO_3$/L)	98		94			
	Temperature (°C)	24.8	24.9	24.9	24.9	24.8	24.6
11.3%	pH (S.U.)	7.54	7.60	7.59	7.56	7.54	7.60
	DO (mg/L)	7.8	7.9	8.0	7.9	7.9	7.7
	Conductivity (µmhos/cm)	301		302		299	
	Temperature (°C)	24.9	25.2	24.9	25.2	24.8	24.8
22.6%	pH (S.U.)	7.56	7.60	7.60	7.56	7.55	7.60
	DO (mg/L)	7.8	7.9	8.0	7.9	7.9	7.7
	Conductivity (µmhos/cm)	284		285		284	
	Temperature (°C)	24.9	25.2	24.9	25.3	24.8	24.8
45.2%	pH (S.U.)	7.56	7.58	7.60	7.55	7.57	7.60
	DO (mg/L)	7.8	7.8	8.0	7.9	8.0	7.8
	Conductivity (µmhos/cm)	253		256		253	
	Temperature (°C)	25.0	25.0	24.9	25.1	24.8	25.0
72.6%	pH (S.U.)	7.56	7.59	7.58	7.56	7.55	7.58
	DO (mg/L)	7.8	7.8	8.0	7.9	8.0	7.8
	Conductivity (µmhos/cm)	210		213		206	
	Temperature (°C)	25.0	25.0	24.8	25.1	24.9 ~~25.0~~	24.9
100%	pH (S.U.)	7.55	7.58	7.58	7.54	7.54	7.58
	DO (mg/L)	7.8	7.8	8.0	7.9	8.0	7.8
	Conductivity (µmhos/cm)	166		169		167	
	Alkalinity (mg $CaCO_3$/L)	62				62	
	Hardness (mg $CaCO_3$/L)	69				67	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	25.1	24.8	24.9	25.0	24.9
100% Intake	pH (S.U.)	7.55	7.57	7.59	7.54	7.51	7.46
	DO (mg/L)	7.8	7.8	8.0	7.9	8.1	7.7
	Conductivity (µmhos/cm)	164		171		162	
	Alkalinity (mg $CaCO_3$/L)	62				58	
	Hardness (mg $CaCO_3$/L)	73				76	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	25.3	25.0	24.9	25.1	25.1
		Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

Species: *Ceriodaphnia dubia*
Client: TVA / Sequoyah Nuclear Plant, Outfall 101 **Date:** 05-11-10

		Day							
		3		4		5		6	
	Analyst	BSL	LAB	LAB	BSL	BSL	BCS	BCS	BCS
Concentration	Parameter								
CONTROL	pH (S.U.)	7.41	7.61	7.61	7.65	7.59	7.56	7.64	7.64
	DO (mg/L)	7.9	7.8	7.7	8.1	8.1	8.0	7.8	7.9
	Conductivity (µmhos/cm)	324		332		336		336	
	Alkalinity (mg $CaCO_3$/L)			64		62			
	Hardness (mg $CaCO_3$/L)			94		94			
	Temperature (°C)	24.8	24.8	24.7	24.8	24.8	25.1	24.8	24.8
11.3%	pH (S.U.)	7.46	7.60	7.53	7.66	7.60	7.54	7.50	7.64
	DO (mg/L)	7.8	7.6	7.6	8.1	8.1	8.0	7.6	7.8
	Conductivity (µmhos/cm)	299		308		308		314	
	Temperature (°C)	24.8	25.0	24.7	25.0	24.7	25.1	24.9	24.9
22.6%	pH (S.U.)	7.47	7.59	7.56	7.64	7.61	7.55	7.51	7.62
	DO (mg/L)	7.8	7.6	7.7	8.1	8.1	8.0	7.6	7.8
	Conductivity (µmhos/cm)	282		290		292		294	
	Temperature (°C)	24.8	25.0	24.8	24.9	24.7	24.8	24.9	24.7
45.2%	pH (S.U.)	7.47	7.59	7.56	7.64	7.59	7.54	7.52	7.62
	DO (mg/L)	7.8	7.7	7.8	8.2	8.2	8.0	7.7	7.8
	Conductivity (µmhos/cm)	252		256		257		258	
	Temperature (°C)	24.8	24.9	24.8	24.8	24.7	25.3	24.9	24.9
72.6%	pH (S.U.)	7.46	7.59	7.56	7.63	7.60	7.52	7.51	7.62
	DO (mg/L)	7.8	7.8	7.8	8.2	8.2	8.1	7.8	7.8
	Conductivity (µmhos/cm)	202		206		212		214	
	Temperature (°C)	24.9	24.9	24.8	24.9	24.8	25.0	24.9	24.9
100%	pH (S.U.)	7.46	7.58	7.55	7.61	7.57	7.51	7.52	7.61
	DO (mg/L)	7.8	7.8	7.8	8.2	8.2	8.1	7.9	7.8
	Conductivity (µmhos/cm)	162		166		168		169	
	Alkalinity (mg $CaCO_3$/L)			60					
	Hardness (mg $CaCO_3$/L)			69					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	24.9	24.9	24.7	24.8	25.1	25.1	25.0
100% Intake	pH (S.U.)	7.47	7.56	7.57	7.60	7.57	7.51	7.52	7.60
	DO (mg/L)	7.9	7.7	7.9	8.2	8.3	8.1	8.0	7.8
	Conductivity (µmhos/cm)	160		168		168		171	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			73					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.9	24.8	24.9	25.0	24.8	25.0	24.8	25.0
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

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

Client: Tennessee Valley Authority
Facility: Sequoyah Nuclear Plant
NPDES #: TN0020168
Project #: 6155

County: Rhea
Outfall: 101

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

Test organism information:		*Test information:*		
Organism age:	20.13 HOURS OLD	Randomizing template:	BLUE	
Date and times organisms were born between:	05-10-10 1600	Incubator number and shelf location:	3B	
Organism source:	ATOX BATCH Pp 05-10-10	*Artemia* CHM number:	CHM 511	
		Drying information for weight determination:		
Transfer bowl information:	pH = 7.85 S.U. Temperature = 25.1°C	Date / Time in oven:	05-18-10	1150
		Initial oven temperature:	60°C	
Average transfer volume:	0.1344 mL	Date / Time out of oven:	05-19-10	1150
		Final oven temperature:	60°C	
		Total drying time:	24-HOURS	

Daily feeding and renewal information:

Day	Date	Morning feeding		Afternoon feeding		Test initiation, renewal, or termination		Sample numbers used		MHSW batch used
		Time	Analyst	Time	Analyst	Time	Analyst	Outfall 101	Intake	
0	05-11-10	—	—	1600	JH	1208	JH	100510.01	100510.02	05-09-10
1	05-12-10	0730	JH	1330	JH	1114	JH	100510.01	100510.02	05-10-10
2	05-13-10	0730	JH	1330	JH	1116	JH	100512.16	100512.17	05-10-10
3	05-14-10	0730	JH	1330	JH	1115	JH	100512.16	100512.17	05-10-10
4	05-15-10	0730	JH	1330	JH	1118	JH	100514.09	100514.10	05-13-10
5	05-16-10	0730	JH	1330	JH	1110	JH	100514.09	100514.10	05-14-10
6	05-17-10	0730	JH	1330	JH	1113	JH	100514.09	100514.10	05-14-10
7	05-18-10					1137	JH			

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	>100%
Average weight per initial larvae:	0.897		NOEC	100%
Average weight per surviving larvae:	0.897	≥ 0.25mg/larvae	LOEC	>100%
			ChV	>100%
			IC_{25}	>100%

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 05-11-10

Survival and Growth Data

Day	CONTROL UV-treated				11.3%				22.6%			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10 ISM	10	10 ISM	10 ISM
A = Pan weight (mg) Tray color code: light blue Analyst: BLB Date: 05-03-10	13.06	14.10	12.53	14.10	12.66	14.91	14.87	13.43	14.92	13.55	14.31	13.60
B = Pan + Larvae weight (mg) Analyst: UAB Date: 05-22-10	21.28	23.89	20.77	23.72	22.02	23.52	23.35	23.13	22.82	21.41	23.36	21.02
C = Larvae weight (mg) = B – A	8.22	9.79	8.24	9.62	9.36	8.61	8.48	9.70	7.90	7.86	9.05	7.42
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.822	0.979	0.824	0.962	0.936	0.861	0.848	0.970 ~~0.8~~	0.790	0.786	0.905	0.742
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.897				0.904		-0.87.		0.806		10.17.	

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

Calculations and data reviewed: [illegible]

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 05-11-10

Survival and Growth Data

Day	45.2%				72.6%				100%			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	10	10	10	10
4	10	10	10	10	10	10	10	10	10	10	10	10
5	10	10	10	10	10	10	10	10	10	10	10	10
6	10	10	10	10	10	10	10	10	10	10	10	10
7	10	10	10	10	10	10	10	10	10	10	10	10
A = Pan weight (mg) Tray color code:: light blue Analyst: BW Date: 05-03-10	14.46	14.23	14.97	14.30	12.08	13.66	14.40	12.90	13.47	14.73	12.87	15.57
B = Pan + Larvae weight (mg) Analyst: UAB Date: 05-22-10	23.26	24.68	23.85	23.39	20.72	22.41	23.10	21.51	21.58	23.47	20.95	24.03
C = Larvae weight (mg) = B – A	8.80	8.45	8.88	9.09	8.64	8.75	8.70	8.61	8.11	8.74	8.08	8.46
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.880	0.845	0.888	0.909	0.864	0.875	0.870	0.861	0.811	0.874	0.808	0.846
Average weight per initial number of larvae (mg)	0.881				0.868				0.835			
Percent reduction from control (%)		1.8%				3.3%				6.9%		

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: JA

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 05·11·10

Survival and Growth Data

Day	100% Intake											
	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
0	10	10	10	10								
1	10	10	10	10								
2	10	10	10	10								
3	10	10	10	10								
4	10	10	10	10								
5	10	10	10	10								
6	10	10	10	10								
7	10	10	10	10								
A = Pan weight (mg) Tray color code:: light blue Analyst: MJ Date: 05.03.17	14.74	14.25	13.27	14.45								
B = Pan + Larvae weight (mg) Analyst: LAB Date: 05·22·10	23.15	21.90	21.18	22.56								
C = Larvae weight (mg) = B – A	8.41	7.65	7.91	8.11								
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.841	0.765	0.791	0.811								
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.802		10.6%									

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

Calculations and data reviewed: H

Comments:

Environmental Testing Solutions, Inc.

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
May 11 - 18, 2010

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

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

Project number: 6155
Reveiwed by: Yuma

Not for Compliance Assessment, Internal Laboratory QC

Concentration (%)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight / Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight / Initial number of larvae (mg)	Coefficient of variation (Mean weight per initial number of larvae) (%)	Percent reduction from control (%)
Control	A	10	10	13.06	21.28	8.22	0.822	0.897	9.5	0.822	100.0	0.897	9.5	Not applicable
	B	10	10	14.10	23.89	9.79	0.979			0.979				
	C	10	10	12.53	20.77	8.24	0.824			0.824				
	D	10	10	14.10	23.72	9.62	0.962			0.962				
11.3%	E	10	10	12.66	22.02	9.36	0.936	0.904	6.5	0.936	100.0	0.904	6.5	-0.8
	F	10	10	14.91	23.52	8.61	0.861			0.861				
	G	10	10	14.87	23.35	8.48	0.848			0.848				
	H	10	10	13.43	23.13	9.70	0.970			0.970				
22.6%	I	10	10	14.92	22.82	7.90	0.790	0.806	8.6	0.790	100.0	0.806	8.6	10.1
	J	10	10	13.55	21.41	7.86	0.786			0.786				
	K	10	10	14.31	23.36	9.05	0.905			0.905				
	L	10	10	13.60	21.02	7.42	0.742			0.742				
45.2%	M	10	10	14.46	23.26	8.80	0.880	0.881	3.0	0.880	100.0	0.881	3.0	1.8
	N	10	10	16.23	24.68	8.45	0.845			0.845				
	O	10	10	14.97	23.85	8.88	0.888			0.888				
	P	10	10	14.30	23.39	9.09	0.909			0.909				
72.6%	Q	10	10	12.08	20.72	8.64	0.864	0.868	0.7	0.864	100.0	0.868	0.7	3.3
	R	10	10	13.66	22.41	8.75	0.875			0.875				
	S	10	10	14.40	23.10	8.70	0.870			0.870				
	T	10	10	12.90	21.51	8.61	0.861			0.861				
100%	U	10	10	13.47	21.58	8.11	0.811	0.835	3.8	0.811	100.0	0.835	3.8	6.9
	V	10	10	14.73	23.47	8.74	0.874			0.874				
	W	10	10	12.87	20.95	8.08	0.808			0.808				
	X	10	10	15.57	24.03	8.46	0.846			0.846				
100% Intake	Y	10	10	14.74	23.15	8.41	0.841	0.802	4.0	0.841	100.0	0.802	4.0	10.6
	Z	10	10	14.25	21.90	7.65	0.765			0.765				
	AA	10	10	13.27	21.18	7.91	0.791			0.791				
	BB	10	10	14.45	22.56	8.11	0.811			0.811				

Outfall 101:
Dunnett's MSD value: 0.0916
PMSD: 10.2

Intake:
Dunnett's MSD value: 0.0887
PMSD: 9.9

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

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

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

TVA / Sequoyah Nuclear Plant, Outfall 101
UV-treated
May 11 - 18, 2010
Statistical Analyses

ETS Environmental Testing Solutions, Inc.

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/11/2010	Test ID:	PpFRCR	Sample ID:	**TVA / SQN101**
End Date:	5/18/2010	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
Control	0.8220	0.9790	0.8240	0.9620
11.3	0.9360	0.8610	0.8480	0.9700
22.6	0.7900	0.7860	0.9050	0.7420
45.2	0.8800	0.8450	0.8880	0.9090
72.6	0.8640	0.8750	0.8700	0.8610
100	0.8110	0.8740	0.8080	0.8460
Intake	0.8410	0.7650	0.7910	0.8110

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Control	0.8968	1.0000	0.8968	0.8220	0.9790	9.528	4				0.9003	1.0000
11.3	0.9038	1.0078	0.9038	0.8480	0.9700	6.504	4	-0.184	2.410	0.0916	0.9003	1.0000
22.6	0.8058	0.8985	0.8058	0.7420	0.9050	8.644	4	2.394	2.410	0.0916	0.8513	0.9456
45.2	0.8805	0.9819	0.8805	0.8450	0.9090	3.026	4	0.428	2.410	0.0916	0.8513	0.9456
72.6	0.8675	0.9674	0.8675	0.8610	0.8750	0.720	4	0.770	2.410	0.0916	0.8513	0.9456
100	0.8348	0.9309	0.8348	0.8080	0.8740	3.755	4	1.631	2.410	0.0916	0.8348	0.9272
Intake	0.8020	0.8943	0.8020	0.7650	0.8410	4.003	4					

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.968467712	0.884	0.361535501	-0.39091302
Bartlett's Test indicates equal variances (p = 0.02)	13.71642971	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	0.091605544	0.102152823	0.005745267	0.002889611	0.129300907	5, 18
Treatments vs Control										

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	21.680			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	**>100**			
IC40	>100			
IC50	>100			

TVA / Sequoyah Nuclear Plant, Outfall 101 - Intake
UV-treated
May 11 - 18, 2010

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/11/2010	Test ID:	PpFRCR	Sample ID:	**TVA / SQN101, Intake**
End Date:	5/18/2010	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	DMR-Discharge Monitoring Report
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:	UV-treated				

Conc-%	1	2	3	4
Control	0.8220	0.9790	0.8240	0.9620
11.3	0.9360	0.8610	0.8480	0.9700
22.6	0.7900	0.7860	0.9050	0.7420
45.2	0.8800	0.8450	0.8880	0.9090
72.6	0.8640	0.8750	0.8700	0.8610
100	0.8110	0.8740	0.8080	0.8460
Intake	0.8410	0.7650	0.7910	0.8110

			Transform: Untransformed						1-Tailed	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Control	0.8968	1.0000	0.8968	0.8220	0.9790	9.528	4			
11.3	0.9038	1.0078	0.9038	0.8480	0.9700	6.504	4			
22.6	0.8058	0.8985	0.8058	0.7420	0.9050	8.644	4			
45.2	0.8805	0.9819	0.8805	0.8450	0.9090	3.026	4			
72.6	0.8675	0.9674	0.8675	0.8610	0.8750	0.720	4			
100	0.8348	0.9309	0.8348	0.8080	0.8740	3.755	4			
*Intake	0.8020	0.8943	0.8020	0.7650	0.8410	4.003	4	2.076	1.943	0.0887

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93714929	0.749	0.035344625	-1.47582984
F-Test indicates equal variances (p = 0.14)	7.08368349	47.46722794		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences Treatments vs Control	0.08868433	0.09889526	0.017955125	0.004165792	0.083183944	1, 6

TVA / Sequoyah Nuclear Plant, Outfall 101 - UV-treated
May 11 - 18, 2010

ETS
Environmental Testing Solutions, Inc.

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

Daily Chemical Analyses

Project number: 6155
Reviewed by: Jumel

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)	7.56	7.60	7.62	7.48	7.55	7.52	7.60	7.54	7.60	7.59	7.63	7.49	7.52	7.56
	DO (mg/L)	7.8	7.8	7.9	7.7	7.9	7.9	7.8	7.6	7.8	7.9	8.1	7.9	8.1	8.0
	Conductivity (µmhos/cm)	318		320		311		314		317		311		315	
	Alkalinity (mg/L $CaCO_3$)	62		62						60		64			
	Hardness (mg/L $CaCO_3$)	88		90						94		92			
	Temperature (°C)	24.8	24.6	24.8	24.2	24.7	24.5	24.8	24.3	24.9	24.3	24.9	24.7	24.9	24.5
11.3%	pH (SU)	7.60	7.58	7.63	7.44	7.57	7.52	7.61	7.55	7.60	7.59	7.64	7.49	7.52	7.57
	DO (mg/L)	7.9	7.8	7.9	7.7	7.9	7.8	7.9	7.6	7.8	7.9	8.2	7.9	8.2	7.8
	Conductivity (µmhos/cm)	301		305		300		300		304		309		307	
	Temperature (°C)	24.9	24.8	24.8	24.7	24.9	24.8	24.9	24.8	24.9	24.6	24.8	24.7	24.9	24.5
22.6%	pH (SU)	7.60	7.58	7.63	7.44	7.56	7.53	7.61	7.55	7.60	7.60	7.64	7.49	7.52	7.54
	DO (mg/L)	7.9	7.7	8.0	7.7	7.9	7.8	8.0	7.7	7.9	8.0	8.2	7.9	8.2	7.7
	Conductivity (µmhos/cm)	282		274		282		282		289		296		292	
	Temperature (°C)	24.9	24.8	24.8	24.6	24.9	24.7	24.9	24.5	25.0	24.7	24.9	24.8	24.9	24.4
45.2%	pH (SU)	7.61	7.58	7.63	7.44	7.55	7.53	7.61	7.55	7.59	7.59	7.65	7.48	7.53	7.56
	DO (mg/L)	8.0	7.7	8.0	7.6	7.9	7.9	8.0	7.6	7.9	8.0	8.3	7.8	8.2	7.7
	Conductivity (µmhos/cm)	249		259		247		251		256		259		257	
	Temperature (°C)	24.9	24.5	24.9	24.6	25.0	24.8	24.9	24.5	25.0	24.4	24.9	24.6	24.9	24.5
72.6%	pH (SU)	7.61	7.56	7.62	7.44	7.56	7.52	7.61	7.54	7.60	7.58	7.63	7.46	7.51	7.57
	DO (mg/L)	8.0	7.7	8.0	7.6	7.9	7.9	8.0	7.7	8.0	8.0	8.3	7.8	8.3	7.7
	Conductivity (µmhos/cm)	209		213		208		208		214		219		215	
	Temperature (°C)	24.9	24.5	24.9	24.5	25.0	24.5	24.9	24.6	25.0	24.7	24.9	24.6	24.9	24.5
100%	pH (SU)	7.58	7.52	7.61	7.42	7.55	7.51	7.58	7.50	7.60	7.56	7.61	7.46	7.50	7.55
	DO (mg/L)	8.0	7.7	8.1	7.7	8.0	8.0	8.1	7.6	7.9	8.1	8.3	7.8	8.3	7.8
	Conductivity (µmhos/cm)	170		173		169		165		170		172		171	
	Alkalinity (mg/L $CaCO_3$)	60				62				62					
	Hardness (mg/L $CaCO_3$)	71				69				69					
	Temperature (°C)	25.1	24.7	24.9	24.5	25.2	24.5	25.0	24.6	25.0	24.6	25.0	24.6	25.0	24.5
100% Intake	pH (SU)	7.58	7.55	7.62	7.44	7.53	7.52	7.59	7.52	7.58	7.56	7.60	7.47	7.50	7.55
	DO (mg/L)	8.0	7.7	8.1	7.8	8.1	7.8	8.1	7.6	7.8	8.1	8.3	7.9	8.3	7.8
	Conductivity (µmhos/cm)	167		167		159		160		167		166		166	
	Alkalinity (mg/L $CaCO_3$)	62				59				62					
	Hardness (mg/L $CaCO_3$)	67				69				69					
	Temperature (°C)	25.0	24.6	25.0	24.8	25.1	24.6	24.8	24.7	24.9	24.3	24.8	24.6	25.2	24.6

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** **Date:** 05-11-10

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

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	BCS	BCS	BCS	BCS	BCS	BCS
Concentration	**Parameter**						
CONTROL UV-treated	**pH** (S.U.)	7.56	7.60	7.62	7.48	7.55	7.52
	DO (mg/L)	7.8	7.8	7.9	7.7	7.9	7.9
	Conductivity (µmhos/cm)	318		320		311	
	Alkalinity (mg $CaCO_3$/L)	62		62			
	Hardness (mg $CaCO_3$/L)	88		90			
	Temperature (°C)	24.8	24.6	24.8	24.2	24.7	24.5
11.3%	**pH** (S.U.)	7.60	7.58	7.63	7.44	7.57	7.52
	DO (mg/L)	7.9	7.8	7.9	7.7	7.9	7.8
	Conductivity (µmhos/cm)	301		305		300	
	Temperature (°C)	24.9	24.8	24.8	24.7	24.9	24.8
22.6%	**pH** (S.U.)	7.60	7.58	7.63	7.44	7.56	7.53
	DO (mg/L)	7.9	7.7	8.0	7.7	7.9	7.8
	Conductivity (µmhos/cm)	282		274		282	
	Temperature (°C)	24.9	24.8	24.8	24.6	24.9	24.7
45.2%	**pH** (S.U.)	7.61	7.58	7.63	7.44	7.55	7.53
	DO (mg/L)	8.0	7.7	8.0	7.6	7.9	7.9
	Conductivity (µmhos/cm)	249		259		247	
	Temperature (°C)	24.9	24.5	24.9	24.6	25.0	24.8
72.6%	**pH** (S.U.)	7.61	7.56	7.62	7.44	7.56	7.52
	DO (mg/L)	8.0	7.7	8.0	7.6	7.9	7.9
	Conductivity (µmhos/cm)	209		213		208	
	Temperature (°C)	24.9	24.5	24.9	24.5	25.0	24.5
100%	**pH** (S.U.)	7.58	7.52	7.61	7.42	7.55	7.51
	DO (mg/L)	8.0	7.7	8.1	7.7	8.0	8.0
	Conductivity (µmhos/cm)	170		173		169	
	Alkalinity (mg $CaCO_3$/L)	60				62	
	Hardness (mg $CaCO_3$/L)	71				69	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.1	24.7	24.9	24.5	25.2	24.5
100% Intake	**pH** (S.U.)	7.58	7.55	7.62	7.44	7.53	7.62
	DO (mg/L)	8.0	7.7	8.1	7.8	8.1	7.8
	Conductivity (µmhos/cm)	167		167		159	
	Alkalinity (mg $CaCO_3$/L)	62				59	
	Hardness (mg $CaCO_3$/L)	67				69	
	TR chlorine (mg/L)	<0.10				<0.10	
	Temperature (°C)	25.0	24.6	25.0	24.8	25.1	24.6
		Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas***
Client: **TVA / Sequoyah Nuclear Plant, Outfall 101, UV-treated** **Date:** 05-11-10

		Day							
		3		4		5		6	
	Analyst	KWW	LAB	BSLAB	BSL	BSL	BCS	BCS	BCS
Concen-tration	Parameter								
CONTROL UV-treated	pH (S.U.)	7.60	7.54	7.60	7.59	7.63	7.49	7.52	7.56
	DO (mg/L)	7.8	7.6	7.8	7.9	8.1	7.9	8.1	8.0
	Conductivity (µmhos/cm)	314		317		311		315	
	Alkalinity (mg $CaCO_3$/L)			60		64			
	Hardness (mg $CaCO_3$/L)			94		92			
	Temperature (°C)	24.8	24.3	24.9	24.3	24.9	24.7	24.9	24.5
11.3%	pH (S.U.)	7.61	7.55	7.60	7.59	7.64	7.49	7.52	7.57
	DO (mg/L)	7.9	7.6	7.8	7.9	8.2	7.9	8.2	7.8
	Conductivity (µmhos/cm)	300		304		309		307	
	Temperature (°C)	24.9	24.8	24.9	24.6	24.8	24.7	24.9	24.5
22.6%	pH (S.U.)	7.61	7.55	7.60	7.60	7.64	7.49	7.52	7.54
	DO (mg/L)	8.0	7.7	7.9	8.0	8.2	7.9	8.2	7.7
	Conductivity (µmhos/cm)	282		289		296		292	
	Temperature (°C)	24.9	24.5	25.0	24.7	24.9	24.8	24.9	24.4
45.2%	pH (S.U.)	7.61	7.55	7.59	7.59	7.65	7.48	7.53	7.56
	DO (mg/L)	8.0	7.6	7.9	8.0	8.3	7.8	8.2	7.7
	Conductivity (µmhos/cm)	257		256		259		257	
	Temperature (°C)	24.9	24.5	25.0	24.4	24.9	24.6	24.9	24.5
72.6%	pH (S.U.)	7.61	7.54	7.60	7.58	7.63	7.46	7.51	7.57
	DO (mg/L)	8.0	7.7	8.0	8.0	8.3	7.8	8.3	7.7
	Conductivity (µmhos/cm)	208		214		219		215	
	Temperature (°C)	24.9	24.6	25.0	24.7	24.9	24.6	24.9	24.5
100%	pH (S.U.)	7.08	7.50	7.60	7.56	7.61	7.46	7.50	7.55
	DO (mg/L)	8.1	7.6	7.9	8.1	8.3	7.8	8.3	7.8
	Conductivity (µmhos/cm)	165		170		172		171	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			69					
	TR Chlorine (mg/L)			<0.10					
	Temperature (°C)	25.0	24.6	25.0	24.6	25.0	24.6	25.0	24.5
100% Intake	pH (S.U.)	7.59	7.52	7.58	7.56	7.60	7.47	7.50	7.55
	DO (mg/L)	8.1	7.6	7.8	8.1	8.3	7.9	8.3	7.8
	Conductivity (µmhos/cm)	160		167		166		166	
	Alkalinity (mg $CaCO_3$/L)			62					
	Hardness (mg $CaCO_3$/L)			69					
	TR chlorine (mg/L)			<0.10					
	Temperature (°C)	24.8	24.7	24.9	24.3	24.8	24.6	25.2	24.6
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst: BCS / MHF
Date analyzed: 05·11·10

Iodide reagent: INR 386
Acid reagent: INR 387

Calibration:

	0.10 mg/L	1.00 mg/L	Slope
Reference standard number	INSS ~~6739~~ 768	INSS ~~6739~~ 768	-50.8%

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 768	0.50	0.547	109.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
100511.04	Corr	pale tan, clear, particles	S <0.00392	
↓	Duplicate		D <0.00262	BCS

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		<0.00992
100510.03	Maggie Valley	pale tan, clear, particles	<0.000633
100511.05	Cape Fear outfall 007	tan, clear, particles	0.000662
100511.03	Foxwood	pale tan, clear, particles	<0.0000600
100511.06	Cape Fear up/intake	tan, slightly cloudy, particles	0.0210
100511.06	Owasa	no color, clear, particles	<0.00467
100510.02	SQN - intake-Tox	pale tan, clear, particles	<0.00252
100510.01	↓ 101-Tox B	no color, clear, particles	0.00155
100511.02	BFN - intake	tan, slightly cloudy, particles	<0.00172
100511.03	↓ Diffuser	tan, slightly cloudy, particles	<0.00218

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 768	0.50	0.544	108.8%

Reviewed by: KG
Date reviewed: 05·12·10

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	BLS	Iodide reagent:	INR 386
Date analyzed	05.13.10	Acid reagent:	INR 387

Calibration:

	0.10 mg/L	1.00 mg/L	Slope
Reference standard number	INSS 768	INSS 768	-52.7%

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 768	0.50	0.547	109.4%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
100513.04	Corr A1	no odor, clear, particles	S <0.0244	
1	Duplicate		D <0.0147	BLS

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		<0.0395
100513.03	Foxwood SD	pale tan, clear, particles	<0.000669
100513.05	McClure NS-001	no odor, clear, particles	<0.000443
100513.06	Shearon ~~Harris~~ HARRIS	no odor, clear	<0.00330
100512.15	Maggie Valley	~~Aqua~~ pale tan, slightly cloudy, particles	<0.000218
100512.16	SQN - 101 Tox B	pale tan, clear	0.000242
100512.17	↓ Int. Tox	pale tan, clear	0.000856
100513.01	BFN - Diffuser	tan, slightly cloudy, particles	0.00639
100513.02	↓ Intake	tan, cloudy, particles	<0.00521
			BLS

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

Laboratory control standard:

Reference standard number	True value (TV) (mg/L)	Measured value (MV) (mg/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 768	0.50	0.544	108.8%

Reviewed by	KLW
Date reviewed	05.13.10

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	KGL	Iodide reagent:	INR386
Date analyzed	05-15-10	Acid reagent:	INR397

Calibration:

	0.10 mg/L	1.00 mg/L	Slope
Reference standard number	INS576Θ	INS576Θ	-51.9%

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%)
INS576Θ	0.50	0.481	96.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
100515.03	Fuquwood	pale tan, clear	S <0.00593	
↓	Duplicate		D <0.00326	-1

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		<0.00928
100514.01	Cape Fear 007	pale tan, clear, particles	0.00153
100514.02	↓ UP/INT	tan, slightly cloudy, particles	~~0.00~~ 0.0193
100514.08	OWASA	pale yellow, clear	<0.00749
100514.03	Mt. Pisgah	pale tan, clear	<0.00170
100514.05	Comm-Scope	pale tan, clear	<0.000714
100515.06	Dallas	tan, clear, particles	<0.000292
100515.05	Enfield ↓	no color, clear	<0.000265
100515.07	Lee Plant	no color, clear	<0.00641
100514.06	Marion	pale yellow, clear	<0.00310

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

~~Laboratory control standard:~~

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

Reviewed by	
Date reviewed	05-15-10

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	KW	Iodide reagent:	—
Date analyzed	05.15.10	Acid reagent:	—

Calibration:

	~~0.10 mg/L~~	~~1.00 mg/L~~	Slope
Reference standard number			

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%)
LNSS7108	0.50	0.471	94.2%

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
100515.08	McGill.pe -005	paleyellow Clear	S <0.000113	
↓	Duplicate		D <0.000104	—

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		—
100515.09	Scarlett Acres	gray, slightly cloudy, bkparticles	<0.0248
100515.10	Scotland Neck	paleyellow Clear	<0.000850
100514.07	Spruce Pine	yellow, clear	<0.000409
100515.11	Cravens Co	paleyellow, Clear	0.0136
100515.04	Clear - A1	no color, Clear	<0.00002
100515.12	Pinora, Inc	no color, Clear, organic debris	<0.00523
100514.04	Maggie Valley	pale yellow, Clear	<0.000624
100514.09	TVA - SQN - 101	paletan, Clear	<0.00457
100514.10	↓ INT	paletan, Clear	<0.00353

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

Laboratory control standard:

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

Reviewed by	[signature]
Date reviewed	05.15.10

ETS
Environmental Testing Solutions, Inc.

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

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

Analyst	KW	Iodide reagent:	
Date analyzed	05.15.10	Acid reagent:	

Calibration:

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

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%)
	0.50		

Duplicate sample precision:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
			S	
	Duplicate		D	

Sample measurements:

Sample number	Sample ID	Sample characteristics	Residual chlorine (mg/L)
	Reagent Blank		—
100515.01	TVA-BFN - Diffuser	pale yellow, slightly cloudy, particle	<0.00207
100515.02	↓ INT	pale yellow, clear	<0.00236

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%)
INS5768	0.50	0.46	92.8%

Reviewed by	
Date reviewed	05.15.10

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst	BSL
Date analyzed	05.16.10

Titrate samples to pH = 4.5 S.U.

Time initiated	~~1000~~ BSL 1100
Time completed	1313

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (*N*) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (*N* x 50000)/ 100 ml sample = *N* x 500
~~7~~ BSL 4.95	INR382	INS5815	0.0	11.8	11.8	0.0212	10.6

Blk Corr: 0.0 - 0.0 = 0.0ml

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5786	100	100	11.8	21.2	9.4	10.6	100	100%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-12-10	SALTSW	100	21.2	32.2	11.0	10.6	S 120	
↓	Duplicate (B)	↓	32.2	42.9	10.7	↓	D 110	8.7%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INS5786	50	100	32.2	47.8	15.6	10.6	160

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
110	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
05-15-10	SALTSW	100	0.0	11.5	11.5	10.6	120
05-12-10	SSW	↓	11.5	14.6	3.1	↓	33
05-09-10	MHSW	↓	14.6	20.6	6.0	↓	64
05-10-10	↓	↓	20.6	26.5	5.9	↓	~~63~~ 62
05-11-10	↓	↓	26.5	32.3	5.8	↓	~~64~~ 62
05-13-10	↓	↓	32.3	38.3	6.0	↓	64
05-14-10	↓	↓	38.3	44.1	5.8	↓	~~64~~ 62
05-15-10	↓	↓	44.1	50.0	5.9	↓	~~63~~ 62
05-09-10	MHSW UV ①	↓	0.0	5.8	5.8	↓	~~64~~ 62

Reviewed by: KGL Date reviewed: 05-16-10

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: BSL

Date analyzed: 05.16.10

Titrate samples to pH = 4.5 S.U.

Time initiated:

Time completed:

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INS5786	100	100	5.8	15.4	9.6	10.6	102	102%

Duplicate sample precision:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)	%RPD = {(S - D) /[(S+D)/2]} x 100 (acceptable range = ± 10%)
05-10-10	MHSW UV (2)	100	15.4	21.2	5.8	10.6	S ~~63~~ 62	
↓	Duplicate (B)	↓	21.2	27.1	5.9	↓	D ~~63~~ 62	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 alkalinity (A) (mg $CaCO_3$/L)
INS5786	50	100	21.2	32.0	10.8	10.6	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%)
~~63~~ 62	~~47~~ 48	~~94%~~ 96.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
05-13-10	MHSW UV (3)	100	32.0	37.7	5.7	10.6	60
05-14-10	↓ (4)	↓	37.7	43.7	6.0	↓	64
100510.04	MAGGIE VALLEY (1)	↓	43.7	45.2	1.5	↓	16
100512.15	↓ (2)	↓	0.0	2.0	2.0	↓	21
100514.04	↓ (3)	↓	2.0	3.8	1.8	↓	19
100511.04	CORR. AL (1)	25	3.8	8.0	4.2	(4)	180
100513.04	↓ (2)	↓	8.0	12.5	4.5	↓	190
100515.04	↓ (3)	↓	12.5	17.4	4.9	↓	210
100511.03	FOXWOOD (1)	↓ 100	17.4	28.1	10.7	↓	110

Reviewed by: KGL

Date reviewed: 05.17.10

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: BSC

Date analyzed: 05.16.10

Time initiated:

Time completed:

Titrate samples to pH = 4.5 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 786	100	100	28.1	37.6	9.5	10.6	101	101%

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%)
100513.03	FOXWOOD (2)	~~100~~ 25 BSC	37.6	40.6	3.0	(4) 10.6	S 130	
↓	Duplicate (B)	↓	40.6	43.7	3.1	↓ ↓	D 130	0%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 786	200	25	40.6	48.5	7.9	(4) 10.6	330

Sample alkalinity (B) (mg $CaCO_3$/L)	Measured spike value (MV) MV = A - B (mg $CaCO_3$/L)	% R = MV / SV x 100 (acceptable range = 75 to 125%)
130	200	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
100515.03	FOXWOOD (3)	~~100~~ BSC 25	0.0	3.7	3.7	(4) 10.6	~~150~~ 160
100511.01	TVA/BFN 001 (1)	100	3.7	10.4	6.7		71
100513.01	(2)		10.4	16.5	6.1		65
100515.01	(3)		16.5	23.0	6.5		69
100511.02	TVA/BFN INTAKE (1)		23.0	29.4	6.4		68
100513.02	(2)		29.4	35.6	6.2		66
100515.02	(3)		35.6	41.6	6.0		64
100510.01	TVA/SQN101 NONTREATED (1)		41.6	47.4	5.8		~~60~~ 62
100512.16	(2)		0.0	5.8	5.8		~~60~~ 62

Reviewed by: KLL

Date reviewed: 05.16.10

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: ~~05-16~~ BSL

Date analyzed: 05-16-10

Time initiated:

Time completed:

Titrate samples to pH = 4.5 S.U.

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS786	100	100	5.8	15.3	9.5	10.6	101	101%

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%)
100514.09	TVA/SQN ~~INTAKE~~ NONTREATED 101 (3)	100	15.3	21.0	5.7	10.6	S 60	
↓	Duplicate (B)	↓	21.0	26.7	5.7	↓	D 60	0%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS786	50	100	21.0	31.5	10.5	10.6	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%)
60	50	100%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
100510.02	TVA/SQN INTAKE NONTREATED (1)	100	31.5	37.3	5.8	10.6	~~61~~ 62
100512.17	(2)		37.3	42.8	5.5		58
100514.10	(3)		42.8	48.6	5.8		~~61~~ 62
100510.01	TVA/SQN 101 UN-TREATED (1)		0.0	5.7	5.7		60
100512.16	(2)		5.7	11.5	5.8		~~61~~ 62
100514.09	(3)		11.5	17.3	5.8		~~61~~ 62
100510.02	TVA/SQN INTAKE UN-TREATED (1)		17.3	23.1	5.8		~~61~~ 62
100512.17	(2)		23.1	28.7	5.6		59
100514.10	(3)		28.7	34.5	5.8		~~61~~ 62

Reviewed by: 05-16-10 Date reviewed: BSL

ETS Environmental Testing Solutions, Inc.

Alkalinity (SM 2320 B)

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

Analyst: BSC

Date analyzed: 05.16.10

Titrate samples to pH = 4.5 S.U.

Time initiated:

Time completed:

Titrant normality and multiplier determination:

pH of Deionized water = 4.5 S.U.	Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of H_2SO_4 = (5 ml Na_2CO_3 x 0.05)/E = 0.25/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 100 ml sample = N x 500

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS786	100	100	34.5	44.3	9.8	10.6	104	104%

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%)
100512.12	TVA|KIF ERM NONTREATED	100	44.3	45.1	0.8	10.6	S 8.5	
↓	Duplicate (B)	↓	0.0	0.8	0.8	↓	D 8.5	0%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike alkalinity (A) (mg $CaCO_3$/L)
INSS 786	50	100	0.0	5.8	5.8	10.6	~~61~~ 62

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%)
8.5	~~52~~ 53.5	~~104%~~ 107.0%

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Alkalinity (mg $CaCO_3$/L)
100512.14	TVA|KIF ALUME NONTREATED	100	5.8	7.5	1.7	10.6	18
100512.13	TVA|KIF 001 NONTREATED	↓	7.5	10.2	2.7	↓	29
100512.12	TVA|KIF ERM UNTREATED	↓	10.2	11.7	1.5	↓	16
100512.14	TVA|KIF ALUME UV-TREATED	↓	11.7	13.6	1.9	↓	20
100512.13	TVA|KIF 001 UV-TREATED	↓	13.6	16.4	2.8	↓	30
100405.04	ABDMRCR	↓	16.4	22.1	5.7	↓	60
↓	ABDMRAC	↓	22.1	32.8	10.7	↓	110
						BSC	

Reviewed by: [illegible]

Date reviewed: 05.16.10

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	BSC	Time initiated	0859
Date analyzed	05.16.10	Time completed	1045

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (*N*) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (*N* x 50000)/ 50 ml sample = *N* x 1000
INR358	INS5702	0.0	9.8	9.8	0.0204	20.4

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 789	40	50	9.8	11.7	1.9	20.4	39	98%

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
05.12-10	SSW	50	11.7	14.0	2.3	20.4	S 47	
↓	Duplicate (B)	↓	14.0	16.2	2.2	↓	D 45	4.3%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS789	40	50	14.0	18.2	4.2	20.4	86

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%)
45	41	103%

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	18.2	18.2	0.0	20.4	ND
05.09.10	MHSW	↓	18.2	~~4.9~~ 23.0	4.8	↓	98
05.10.10	↓	↓	23.0	27.6	4.6	↓	94
05.11.10	↓	↓	27.6	32.1	4.5	↓	92
05.13.10	↓	↓	32.1	36.7	4.6	↓	94
05.14.10	↓	↓	36.7	41.3	4.6	↓	94
05.15.10	↓	↓	41.3	45.8	4.5	↓	92
05.09.10	MHSW UV (1)	↓	0.0	~~4.1~~ 4.3	4.3	↓	88
05.10.10	↓ (2)	↓	4.3	8.7	4.4	↓	90
05.13.10	↓ (3)	↓	8.7	13.3	4.6	↓	94

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KOL Date reviewed 05.16.10

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst: BSC

Date analyzed: 05.16.10

Time initiated:

Time completed:

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (N) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (N x 50000)/ 50 ml sample = N x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 789	40	50	13.3	15.2	1.9	20.4	39	98%

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
05.14.10	MHSW UV (4)	50	15.2	19.7	4.5	20.4	S 92	
↓	Duplicate (B)	↓	19.7	24.1	4.4	↓	D 90	2.2%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 789	40	50	19.7	26.0	6.3	20.4	130

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

Sample measurements:

Sample number	Sample ID	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (mg $CaCO_3$/L)
TV = ND	Blank (should be = 0 mg $CaCO_3$/L)						
100510.04	MAGGIE VALLEY (1)	50	26.0	29.0	3.0	20.4	61
100512.15	↓ (2)	↓	29.0	31.7	2.7		55
100514.04	↓ (3)	↓	31.7	34.4	2.7		55
100511.04	CORR, AL (1)	10	34.4	36.3	1.9	(5)	190
100513.04	↓ (2)	↓	36.3	38.3	2.0		200
100515.04	↓ (3)	↓	38.3	40.1	1.8		180
100511.03	FOXWOOD (1)	50	40.1	45.4	5.3		110
100513.03	↓ (2)	↓	0.0	7.0	7.0		140
100515.03	↓ (3)	↓	7.0	14.1	7.1		140

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KCM Date reviewed: 05-16.10

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	BSL
Date analyzed	05-16-10

Time initiated	
Time completed	

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (*N*) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (*N* x 50000)/ 50 ml sample = *N* x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 789	40	50	14.1	16.2	2.1	20.4	43	108%

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
100511.01	TVA/BFN 001 (1)	50	16.2	19.6	3.4	20.4	S 69	
↓	Duplicate (B)	↓	19.6	23.2	3.6	↓	D 73	5.6%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 789	40	50	19.6	25.1	5.5	20.4	110

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%)
73	37	92%

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)						
100513.01	TVA/BFN 001 (2)	50	25.1	28.7	3.6	20.4	73
100515.01	↓ (3)		28.7	32.1	3.4		69
100511.02	TVA/BFN INTAKE (1)		32.1	35.6	3.5		71
100513.02	(2)		35.6	39.1	3.5		71
100515.02	↓ (3)		39.1	42.6	3.5		71
100510.01	TVA/SQN 101 NONTREATED (1)		42.6	46.0	3.4		69
100512.16	(2)		46.0	49.3	3.3		67
100514.09	↓ (3)		0.0	3.4	3.4		69
100510.02	TVA/SQN INTAKE NONTREATED (1)		3.4	7.0	~~7.0~~ 3.6 BSL		73

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: KEN Date reviewed 05-16-10

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst: BSL

Date analyzed: 05-16-10

Time initiated:

Time completed:

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (*N*) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (*N* x 50000)/ 50 ml sample = *N* x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS 789	40	50	7.0	9.1	2.1	20.4	43	108%

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
100512.17	TVA|SQN INTAKE NONTREATED (2)	50	~~2.1~~ 9.1	12.8	3.7	20.4	S ~~75~~ 76	
↓	Duplicate (B)	↓	12.3	16.5	3.7	↓	D ~~73~~ 76	0%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS 789	40	50	12.8	18.1	5.3	20.4	110

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%)
75	35	88%

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)						
100514.10	TVA|SQN INTAKE NONTREATED (3)	50	18.1	21.7	3.6	20.4	73
100510.01	TVA|SQN 101 UV-TREATED (1)	↓	21.7	25.2	3.5	↓	71
100512.16	↓ (2)		25.2	28.6	3.4		69
100514.09	↓ (3)		28.6	32.0	3.4		69
100510.02	TVA|SQN INTAKE UV-TREATED (1)		32.0	35.3	3.3		67
100512.17	↓ (2)		35.3	38.7	3.4		69
100514.10	↓ (3)		38.7	42.1	3.4		69
100512.12	TVA|KIF ERM NONTREATED		42.1	43.5	1.4		~~28~~ 29
100512.14	TVA|KIF PLUME NONTREATED	↓	43.5	44.9	1.4	↓	~~28~~ 29

Note: If >15ml of titrant is used, sample must be diluted. Reviewed by: HLK Date reviewed: 05-16-10

ETS Environmental Testing Solutions, Inc.

Total Hardness (SM 2340 C)

RL = 1.0 mg $CaCO_3$/L

Analyst	BSL	Time initiated	
Date analyzed	05.16.10	Time completed	

Titrant normality and multiplier determination:

Titrant reference number	Normality check standard number	Begin ml	End ml	Total ml (E)	Normality (*N*) of EDTA = 0.2/E (acceptable range = 0.0180 - 0.0220)	pH Factor or Multiplier = (*N* x 50000)/ 50 ml sample = *N* x 1000

Laboratory control standard:

Reference standard number	True value (TV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Hardness (MV) (mg $CaCO_3$/L)	% RS = MV / TV x 100 (acceptable range = 90 to 110%)
INSS789	40	50	44.9	46.8	1.9	20.4	39	98%

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
100512.13	TVA|KIF 001 NONTREATED	50	46.8	49.6	2.8	20.4	S 57	
↓	Duplicate (B)	↓	20.0	22.8	2.8	↓	D 57	0%

Matrix spike recovery:

Reference standard number	Spike value (SV) (mg $CaCO_3$/L)	Sample volume (ml)	Begin ml	End ml	Total ml	Multiplier	Spike hardness (A) (mg $CaCO_3$/L)
INSS789	40	50	20.0	24.7	4.7	20.4	96

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%)
57	39	98%

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)						
100512.12	TVA|KIF ERM UN-TREATED	50	24.7	26.3	1.6	20.4	33
100512.14	TVA|KIF PLUME UN-TREATED	↓	26.3	27.7	1.4	↓	~~28~~ 29
100512.13	TVA|KIF 001 UN-TREATED		27.7	30.5	2.8	↓	57
100405.04	PDMRCR	↓	30.5	34.9	4.4	↓	90
							BSL

Note: If 1.15 ml of titrant is used, sample must be diluted. Reviewed by: BSL Date reviewed 05.16.10

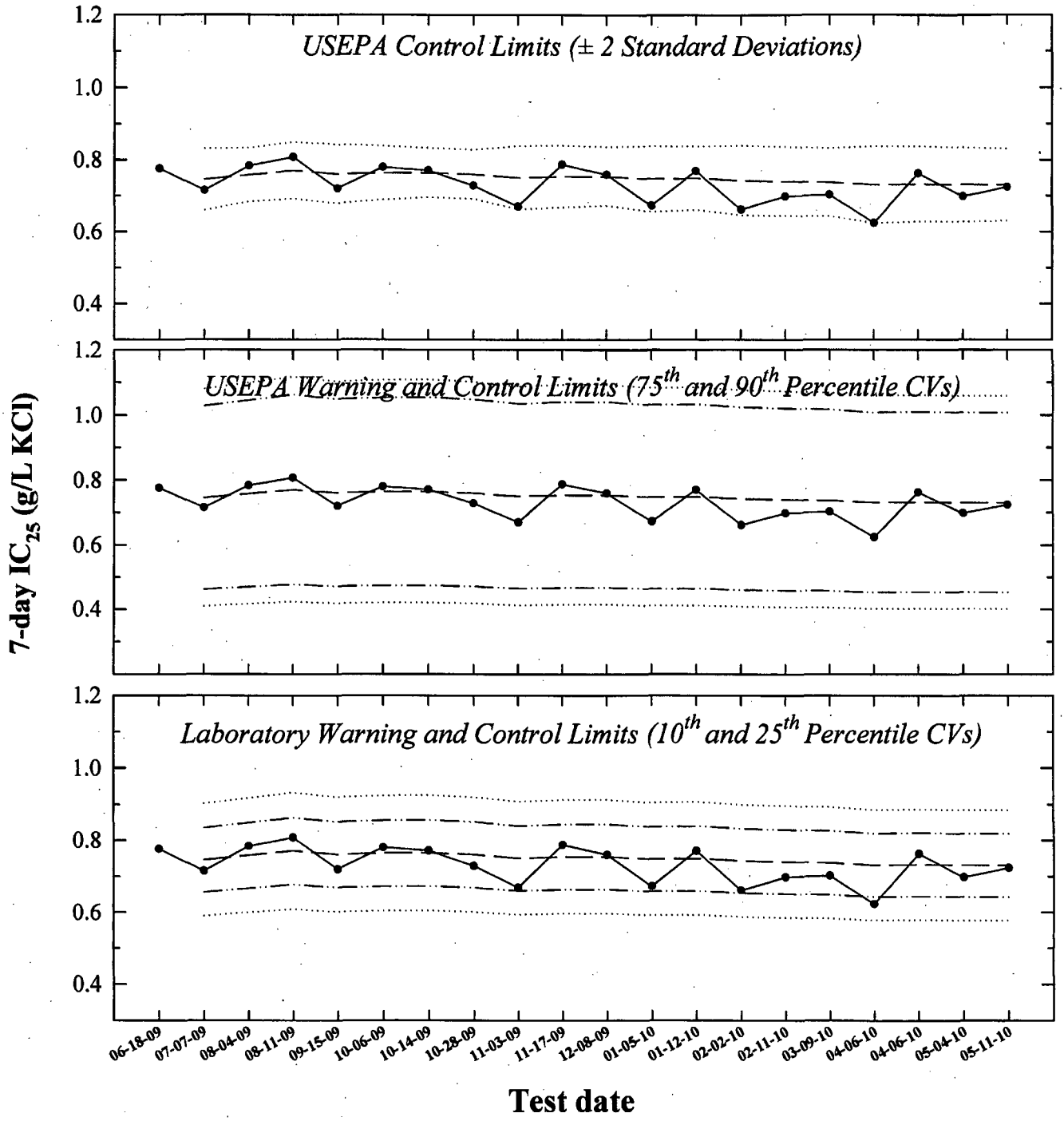
Sequoyah Nuclear Plant Biomonitoring
May 11 – 18, 2010

Appendix D

Reference Toxicant Test and
Control Chart

Environmental Testing Solutions, Inc.

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



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

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

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

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

ETS
Environmental Testing Solutions, Inc.

Pimephales promelas
Chronic Reference Toxicant Control Chart

Test number	Test date	7-day IC_{25} (g/L KCl)	CT (g/L KCl)	S	State and USEPA Control Limits CT - 2S	CT + 2S	$S_{A.10}$	Laboratory Warning Limits CT - $S_{A.10}$	CT + $S_{A.10}$	$S_{A.25}$	Laboratory Control Limits CT - $S_{A.25}$	CT + $S_{A.25}$	$S_{A.75}$	USEPA Warning Limits CT - $S_{A.75}$	CT + $S_{A.75}$	$S_{A.90}$	USEPA Control Limits CT - $S_{A.90}$	CT + $S_{A.90}$	CV
1	06-18-09	0.78																	
2	07-07-09	0.72	0.75	0.04	0.66	0.83	0.09	0.66	0.84	0.16	0.59	0.90	0.28	0.46	1.03	0.34	0.41	1.08	0.06
3	08-04-09	0.78	0.76	0.04	0.68	0.83	0.09	0.67	0.85	0.16	0.60	0.92	0.29	0.47	1.05	0.34	0.42	1.10	0.05
4	08-11-09	0.81	0.77	0.04	0.69	0.85	0.09	0.68	0.86	0.16	0.61	0.93	0.29	0.48	1.06	0.35	0.42	1.12	0.05
5	09-15-09	0.72	0.76	0.04	0.68	0.84	0.09	0.67	0.85	0.16	0.60	0.92	0.29	0.47	1.05	0.34	0.42	1.10	0.05
6	10-06-09	0.78	0.76	0.04	0.69	0.84	0.09	0.67	0.86	0.16	0.60	0.92	0.29	0.47	1.05	0.34	0.42	1.11	0.05
7	10-14-09	0.77	0.76	0.03	0.70	0.83	0.09	0.67	0.86	0.16	0.60	0.93	0.29	0.47	1.06	0.34	0.42	1.11	0.04
8	10-28-09	0.73	0.76	0.03	0.69	0.83	0.09	0.67	0.85	0.16	0.60	0.92	0.29	0.47	1.05	0.34	0.42	1.10	0.05
9	11-03-09	0.67	0.75	0.04	0.66	0.84	0.09	0.66	0.84	0.16	0.59	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.06
10	11-17-09	0.79	0.75	0.04	0.67	0.84	0.09	0.66	0.84	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.06
11	12-08-09	0.76	0.75	0.04	0.67	0.84	0.09	0.66	0.84	0.16	0.60	0.91	0.29	0.47	1.04	0.34	0.41	1.09	0.05
12	01-05-10	0.67	0.75	0.05	0.66	0.84	0.09	0.66	0.84	0.16	0.59	0.90	0.28	0.46	1.03	0.34	0.41	1.08	0.06
13	01-12-10	0.77	0.75	0.04	0.66	0.84	0.09	0.66	0.84	0.16	0.59	0.91	0.28	0.46	1.03	0.34	0.41	1.09	0.06
14	02-02-10	0.66	0.74	0.05	0.65	0.84	0.09	0.65	0.83	0.16	0.59	0.90	0.28	0.46	1.03	0.33	0.41	1.08	0.07
15	02-11-10	0.70	0.74	0.05	0.64	0.84	0.09	0.65	0.83	0.16	0.58	0.90	0.28	0.46	1.02	0.33	0.41	1.07	0.07
16	03-09-10	0.70	0.74	0.05	0.64	0.83	0.09	0.65	0.83	0.15	0.58	0.89	0.28	0.46	1.02	0.33	0.41	1.07	0.06
17	04-06-10	0.62	0.73	0.05	0.62	0.84	0.09	0.64	0.82	0.15	0.58	0.88	0.28	0.45	1.01	0.33	0.40	1.06	0.07
18	04-06-10	0.76	0.73	0.05	0.63	0.84	0.09	0.64	0.82	0.15	0.58	0.89	0.28	0.45	1.01	0.33	0.40	1.06	0.07
19	05-04-10	0.70	0.73	0.05	0.63	0.83	0.09	0.64	0.82	0.15	0.58	0.88	0.28	0.45	1.01	0.33	0.40	1.06	0.07
20	05-11-10	0.72	0.73	0.05	0.63	0.83	0.09	0.64	0.82	0.15	0.58	0.88	0.28	0.45	1.01	0.33	0.40	1.06	0.07

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

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

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

Laboratory Control and Warning Limits

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

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

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

USEPA Control and Warning Limits

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

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

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

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

Organisms obtained from Aquatox, Inc.

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Pimephales promelas
Chronic Reference Toxicant Data

Test number	Test date	Control Survival (%)	Control Mean Growth (mg/larvae)	CT for Control Growth (mg/larvae)	CV (%)	CT for Control Growth CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	06-18-09	100	0.790		6.7		0.09	11.7	
2	07-07-09	100	0.763	0.776	5.7	6.2	0.11	14.2	13.0
3	08-04-09	100	0.692	0.748	6.2	6.2	0.07	10.7	12.2
4	08-11-09	100	0.583	0.707	8.0	6.7	0.05	9.3	11.5
5	09-15-09	100	0.723	0.710	9.6	7.2	0.08	10.4	11.3
6	10-06-09	100	0.894	0.741	12.9	8.2	0.12	13.2	11.6
7	10-14-09	97.5	0.758	0.743	7.6	8.1	0.14	18.3	12.5
8	10-28-09	100	0.855	0.757	6.5	7.9	0.10	12.0	12.5
9	11-03-09	100	0.757	0.757	7.1	7.8	0.07	8.8	12.1
10	11-17-09	97.5	0.825	0.764	8.3	7.9	0.10	11.8	12.0
11	12-08-09	97.5	0.917	0.778	10.0	8.1	0.13	14.6	12.3
12	01-05-10	97.5	0.918	0.789	9.0	8.1	0.11	12.1	12.3
13	01-12-10	100	0.769	0.788	4.0	7.8	0.08	10.7	12.1
14	02-02-10	100	1.019	0.804	17.7	8.5	0.17	16.5	12.5
15	02-11-10	100	0.831	0.806	5.3	8.3	0.07	8.5	12.2
16	03-09-10	100	0.846	0.809	5.2	8.1	0.07	8.4	12.0
17	04-06-10	100	1.101	0.826	4.9	7.9	0.10	8.9	11.8
18	04-06-10	100	1.010	0.836	7.9	7.9	0.14	14.3	11.9
19	05-04-10	97.5	0.871	0.838	9.7	8.0	0.13	15.0	12.1
20	05-11-10	100	0.901	0.841	1.8	7.7	0.07	7.7	11.9

Note:

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

MSD = Minimum Significant Difference

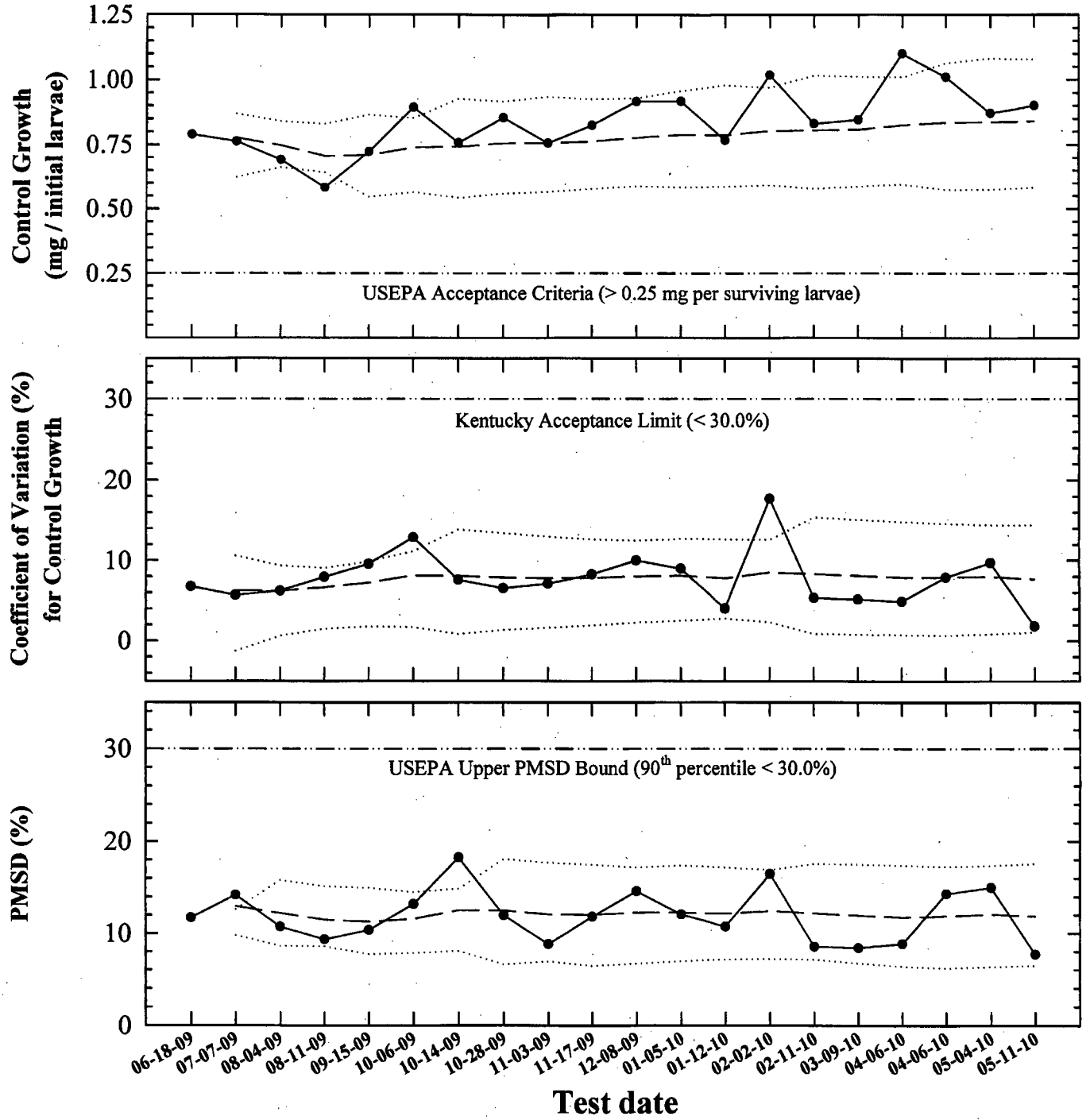
PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 12%.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

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

USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.
USEPA. 2001a, 2001b. Final Report: Interlaboratory Variability Study of EPA Short-term Chronic and Acute Whole Effluent Toxicity Test Methods, Volumes 1 and 2 Appendix. EPA-821-B-01-004 and EPA-821-B-01-005. US Environmental Protection Agency, Cincinnati, OH.

Environmental Testing Solutions, Inc.

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



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

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

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

ETS
Environmental Testing Solutions, Inc.

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

PpKClCR Test Number: 204

Dilution preparation information:						*Comments:*
KCl Stock INSS number:	INSS 811					
Stock preparation:	50 g KCl/L: Dissolve 50 g KCl in 1-L Milli-Q water.					
Dilution prep (mg/L)	450	600	750	900	1050	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	991	988	985	982	979	
Total volume (mL)	1000	1000	1000	1000	1000	

Test organism information:		*Test information:*	
Organism age:	19.25 ~~18.50~~ HOURS OLD	Randomizing template:	RED
Date and times organisms were born between:	05-10-10 1600	Incubator number and shelf location:	3F
Organism source:	ATOX BATCH Pp 05-10-10	*Artemia* CHM number:	CHM511
		Drying information for weight determination:	
Transfer vessel information:	pH = 7.85 S.U. Temperature = 25.1 °C	Date / Time in oven:	05-18-10 1150
		Initial oven temperature:	60°C
Average transfer volume:	0.1344 mL	Date / Time out of oven:	05-19-10 1150
		Final oven temperature:	60°C
		Total drying time:	24 HOURS

Daily feeding and renewal information:

Day	Date	Morning feeding		Afternoon feeding		Test initiation, renewal, or termination		MHSW batch used
		Time	Analyst	Time	Analyst	Time	Analyst	
0	05-11-10	—	—	1600	JH	1115	JH	05-09-10
1	05-12-10	0730	JH	1330	JH	1015	JH	05-10-10
2	05-13-10	0730	JH	1330	JH	1017	JH	05-10-10
3	05-14-10	0730	JH	1330	JH	1015	JH	05-10-10
4	05-15-10	0730	JH	1330	JH	1015	JH	05-13-10
5	05-16-10	0730	JH	1330	JH	1017	JH	05-14-10
6	05-17-10	0730	JH	1330	JH	1015	JH	05-14-10
7	05-18-10					1030	JH	

Control information:		Acceptance criteria	*Summary of test endpoints:*	
% Mortality:	0%	≤ 20%	7-day LC_{50}	847.4
Average weight per initial larvae:	0.901		NOEC	<450
Average weight per surviving larvae:	0.901	≥ 0.25 mg/larvae	LOEC	450
			ChV	<450
			IC_{25}	724.1

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKClCR Test Number: 204

Survival and Growth Data

Day	Control				450 mg KCl/L				600 mg KCl/L			
	A	B	C	D	E	F	G	H	I	J	K	L
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	10	10	10	10	10	10	10	10	10	10	10
2	10	10	10	10	10	10	10	10	10	10	10	10
3	10	10	10	10	10	10	10	10	9 id	10	10	9 id
4	10	10	10	10	10	10	10	10	9	10	10	9
5	10	10	10	10	10	10	10	10	9	10	10	9
6	10	10	10	10	10	10	10	10	9	10	10	9
7	10	10	10	10	10	10	10	10 ISM	9	10	10	9
A = Pan weight (mg) Tray color code:: L.pink Analyst: LAB Date: 05-15-10	12.85	13.50	14.14	14.84	13.18	13.49	14.39	13.41	12.92	14.40	12.70	12.88
B = Pan + Larvae weight (mg) Analyst: LAB Date: 05-22-10	21.95	22.59	22.90	23.91	22.03	21.86	22.62	21.18	20.23	22.90	21.40	21.15
C = Larvae weight (mg) = B – A	9.10	9.09	8.76	9.07	8.85	8.37	8.23	7.77	7.31	8.50	8.70	8.27
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.910	0.909	0.876	0.907	0.885	0.837	0.823	0.777	0.731	0.850	0.870	0.827
Average weight per initial number of larvae (mg)	0.901				0.831				0.820			
Percent reduction from control (%)							7.6%				9.0%	

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

Calculations and data reviewed: [illegible]

Comments:

ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKClCR Test Number: 204

Survival and Growth Data

Day	750 mg KCl/L				900 mg KCl/L				1050 mg KCl/L			
	M	N	O	P	Q	R	S	T	U	V	W	X
0	10	10	10	10	10	10	10	10	10	10	10	10
1	10	9 1d	10	8 1d	8 2d	7 3d	9 1d	8 2d	3 2d	5 5d	5 5d	4 6d
2	10	9	10	8	8	7	9	7 1d	3	5	5	4
3	10	8 1d	10	8	8	7	9	7	3	5	4 1d	3 1d
4	9 1d	8	9 1d	8	6 2d	7	7 2d	7	2 1d	2 3d	4	2 1d
5	8 1d	8	9	8	5 1d	4 3d	5 2d	6 1d	2	1 1d	3 1d	1 1d
6	8	8	~~9~~ 8 1d	8	4 1d ~~5~~ 1d	~~4~~ 3 1d	5	~~6~~ 5 1d	2	1	~~3~~ 2 1d	0 1d
7	8 1SM	8	8 1SM	7 1d	4 1LG	3 1LG	5 1LG	5 1SM	2	1 LG	0 2d	0
A = Pan weight (mg) Tray color code:: l. pink Analyst: LAB Date: 05-15-10	13.30	13.860	12.960	14.61	13.60	13.88	12.960	14.07	14.50	13.02	12.98	14.18
B = Pan + Larvae weight (mg) Analyst: LAB Date: 05-22-10	19.39	21.060	18.89	21.20	17.79	16.89	17.89	17.92	16.23	14.07	—	—
C = Larvae weight (mg) = B – A	6.09	7.20	5.93	6.59	4.19	3.01	4.93	3.85	1.73	1.05	—	—
Weight per initial number of larvae (mg) = C / Initial number of larvae	0.609	0.720	0.593	0.659	0.419	0.301	0.493	0.385	0.173	0.105	0	0
Average weight per initial number of larvae (mg) / Percent reduction from control (%)	0.645		28.37%		0.400		55.67%		0.070		92.37%	

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

Calculations and data reviewed: JL

Comments:

Environmental Testing Solutions, Inc.

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

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

Test number: PpKClCR #204
Test dates: May 11-18, 2010
Reveiwed by:

Concentration (mg/L KCl)	Replicate	Initial number of larvae	Final number of larvae	A = Pan weight (mg)	B = Pan + Larvae weight (mg)	Larvae weight (mg) = A - B	Weight / Surviving number of larvae (mg)	Mean weight/ Surviving number of larvae (mg)	Coefficient of variation (Mean weight per surviving number of larvae) (%)	Weight / Initial number of larvae (mg)	Mean survival (%)	Mean weight/ Initial number of larvae (mg)	Coefficient of variation (%)	Percent reduction from control (%)
Control	A	10	10	12.85	21.95	9.10	0.910	0.901	1.8	0.910	100.0	0.901	1.8	Not applicable
	B	10	10	13.50	22.59	9.09	0.909			0.909				
	C	10	10	14.14	22.90	8.76	0.876			0.876				
	D	10	10	14.84	23.91	9.07	0.907			0.907				
450	E	10	10	13.18	22.03	8.85	0.885	0.831	5.4	0.885	100.0	0.831	5.4	7.8
	F	10	10	13.49	21.86	8.37	0.837			0.837				
	G	10	10	14.39	22.62	8.23	0.823			0.823				
	H	10	10	13.41	21.18	7.77	0.777			0.777				
600	I	10	9	12.92	20.23	7.31	0.812	0.863	5.1	0.731	95.0	0.820	7.5	9.0
	J	10	10	14.40	22.90	8.50	0.850			0.850				
	K	10	10	12.70	21.40	8.70	0.870			0.870				
	L	10	9	12.88	21.15	8.27	0.919			0.827				
750	M	10	8	13.30	19.39	6.09	0.761	0.836	11.9	0.609	77.5	0.645	8.9	28.3
	N	10	8	13.86	21.06	7.20	0.900			0.720				
	O	10	8	12.96	18.89	5.93	0.741			0.593				
	P	10	7	14.61	21.20	6.59	0.941			0.659				
900	Q	10	4	13.60	17.79	4.19	1.048	0.952	13.0	0.419	42.5	0.400	19.9	55.6
	R	10	3	13.88	16.89	3.01	1.003			0.301				
	S	10	5	12.96	17.89	4.93	0.986			0.493				
	T	10	5	14.07	17.92	3.85	0.770			0.385				
1050	U	10	2	14.50	16.23	1.73	0.865	0.958	13.7	0.173	7.5	0.070	122.2	92.3
	V	10	1	13.02	14.07	1.05	1.050			0.105				
	W	10	0	0.00	0.00	0.00	0.000			0.000				
	X	10	0	0.00	0.00	0.00	0.000			0.000				

Dunnett's MSD value: 0.0691
PMSD: 7.7

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

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

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

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

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Survival

Start Date:	5/11/2010	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/18/2010	Lab ID:	ETS-Envir. Testing Sol.	Sample Type:	KCL-Potassium chloride
Sample Date:		Protocol:	FWCHR-EPA-821-R-02-013	Test Species:	PP-Pimephales promelas
Comments:					

Conc-mg/L	1	2	3	4
D-Control	1.0000	1.0000	1.0000	1.0000
450	1.0000	1.0000	1.0000	1.0000
600	0.9000	1.0000	1.0000	0.9000
750	0.8000	0.8000	0.8000	0.7000
900	0.4000	0.3000	0.5000	0.5000
1050	0.2000	0.1000	0.0000	0.0000

			Transform: Arcsin Square Root					Rank	1-Tailed	Number	Total
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical	Resp	Number
D-Control	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4			0	40
450	1.0000	1.0000	1.4120	1.4120	1.4120	0.000	4	18.00	10.00	0	40
600	0.9500	0.9500	1.3305	1.2490	1.4120	7.072	4	14.00	10.00	2	40
*750	0.7750	0.7750	1.0782	0.9912	1.1071	5.379	4	10.00	10.00	9	40
*900	0.4250	0.4250	0.7088	0.5796	0.7854	13.871	4	10.00	10.00	23	40
*1050	0.0750	0.0750	0.2757	0.1588	0.4636	53.294	4	10.00	10.00	37	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93525082	0.884	0.18640681	0.44284928
Equality of variance cannot be confirmed				

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

Maximum Likelihood-Probit

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	12.7296549	1.68011061	9.43663803	16.0226718	0	2.07591082	7.81472778	0.56	2.92806711	0.07855673	3
Intercept	-32.273284	4.91966684	-41.915831	-22.630737							
TSCR											

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	556.309966	476.653416	611.406975
EC05	3.355	629.292849	561.145281	676.408122
EC10	3.718	672.036124	611.495981	714.601419
EC15	3.964	702.503191	647.501036	742.147769
EC20	4.158	727.699548	677.169156	765.308341
EC25	4.326	750.034785	703.238413	786.272122
EC40	4.747	809.403342	770.273022	845.168712
EC50	5.000	847.358348	810.368169	886.267232
EC60	5.253	887.093169	849.541425	932.655984
EC75	5.674	957.310488	912.874788	1021.89777
EC80	5.842	986.693169	937.802481	1061.32683
EC85	6.036	1022.08245	966.999312	1110.03617
EC90	6.282	1068.41898	1004.21162	1175.46955
EC95	6.645	1140.98889	1060.85213	1281.01769
EC99	7.326	1290.67652	1173.5712	1508.17468

ETS Environmental Testing Solutions, Inc.

Statistical Analyses

Larval Fish Growth and Survival Test-7 Day Growth

Start Date:	5/11/2010	Test ID:	PpKClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/18/2010	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	0.9100	0.9090	0.8760	0.9070
450	0.8850	0.8370	0.8230	0.7770
600	0.7310	0.8500	0.8700	0.8270
750	0.6090	0.7200	0.5930	0.6590
900	0.4190	0.3010	0.4930	0.3850
1050	0.1730	0.1050	0.0000	0.0000

			Transform: Untransformed						1-Tailed		Isotonic	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
D-Control	0.9005	1.0000	0.9005	0.8760	0.9100	1.819	4				0.9005	1.0000
*450	0.8305	0.9223	0.8305	0.7770	0.8850	5.354	4	2.207	2.180	0.0691	0.8305	0.9223
*600	0.8195	0.9100	0.8195	0.7310	0.8700	7.512	4	2.554	2.180	0.0691	0.8195	0.9100
750	0.6453	0.7165	0.6453	0.5930	0.7200	8.867	4				0.6453	0.7165
900	0.3995	0.4436	0.3995	0.3010	0.4930	19.939	4				0.3995	0.4436
1050	0.0695	0.0772	0.0695	0.0000	0.1730	122.184	4				0.0695	0.0772

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.91475314	0.805	-0.882100479	0.97553825
Bartlett's Test indicates equal variances (p = 0.16)	3.65429521	9.2103405		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<450	450			0.06913843	0.07677782	0.007721333	0.00201167	0.062317923	2, 9
Treatments vs D-Control										

Linear Interpolation (200 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05*	289.45	88.49	137.15	662.35	0.9065
IC10	607.79	66.70	256.95	643.51	-1.3729
IC15	646.55	19.61	560.74	683.97	-1.2036
IC20	685.31	17.46	627.50	737.07	0.0018
IC25	724.07	18.45	664.67	781.51	0.2206
IC40	814.06	11.98	776.92	851.88	0.2789
IC50	869.02	16.35	822.81	925.35	0.2723

* indicates IC estimate less than the lowest concentration

ETS Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKClCR Test Number: 204

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	BCS	BCS	BCS	BCS	BCS	KW
Concentration	Parameter						
CONTROL	pH (S.U.)	7.58	7.57	7.46	7.47	7.43	7.36
	DO (mg/L)	7.8	7.7	7.8	7.8	7.8	7.4
	Conductivity (µmhos/cm)	326		327		325	
	Alkalinity (mg $CaCO_3$/L)	64		62			
	Hardness (mg $CaCO_3$/L)	98		94			
	Temperature (°C)	24.9	24.5	24.8	24.7	24.9	24.6
450 mg KCl/L	pH (S.U.)	7.52	7.61	7.52	7.52	7.62	7.46
	DO (mg/L)	7.9	7.7	7.8	7.8	7.8	7.3
	Conductivity (µmhos/cm)	1110		1140		1110	
	Temperature (°C)	25.1	24.2	24.8	24.8	24.9	24.6
600 mg KCl/L	pH (S.U.)	7.59	7.61	7.60	7.52	7.61	7.49
	DO (mg/L)	7.8	7.7	7.8	7.8	7.8	7.4
	Conductivity (µmhos/cm)	1370		1380		1390	
	Temperature (°C)	25.1	24.2	24.8	24.8	24.8	24.6
750 mg KCl/L	pH (S.U.)	7.62	7.60	7.62	7.51	7.62	7.49
	DO (mg/L)	7.8	7.7	7.8	7.8	7.9	7.5
	Conductivity (µmhos/cm)	1640		1640		1640	
	Temperature (°C)	25.2	24.1	24.8	24.6	24.8	24.5
900 mg KCl/L	pH (S.U.)	7.63	7.61	7.63	7.49	7.62	7.50
	DO (mg/L)	7.8	7.7	7.9	7.8	7.9	7.6
	Conductivity (µmhos/cm)	1880		1880		1890	
	Temperature (°C)	25.0	24.3	24.9	24.6	25.0	24.5
1050 mg KCl/L	pH (S.U.)	7.65	7.63	7.65	7.51	7.63	7.54
	DO (mg/L)	7.8	7.7	7.9	7.8	8.0	7.8
	Conductivity (µmhos/cm)	2170		2150		2170	
	Temperature (°C)	25.1	24.1	24.8	24.5	25.0	24.7
STOCK	Conductivity (µmhos/cm)	68100					
		Initial	Final	Initial	Final	Initial	Final

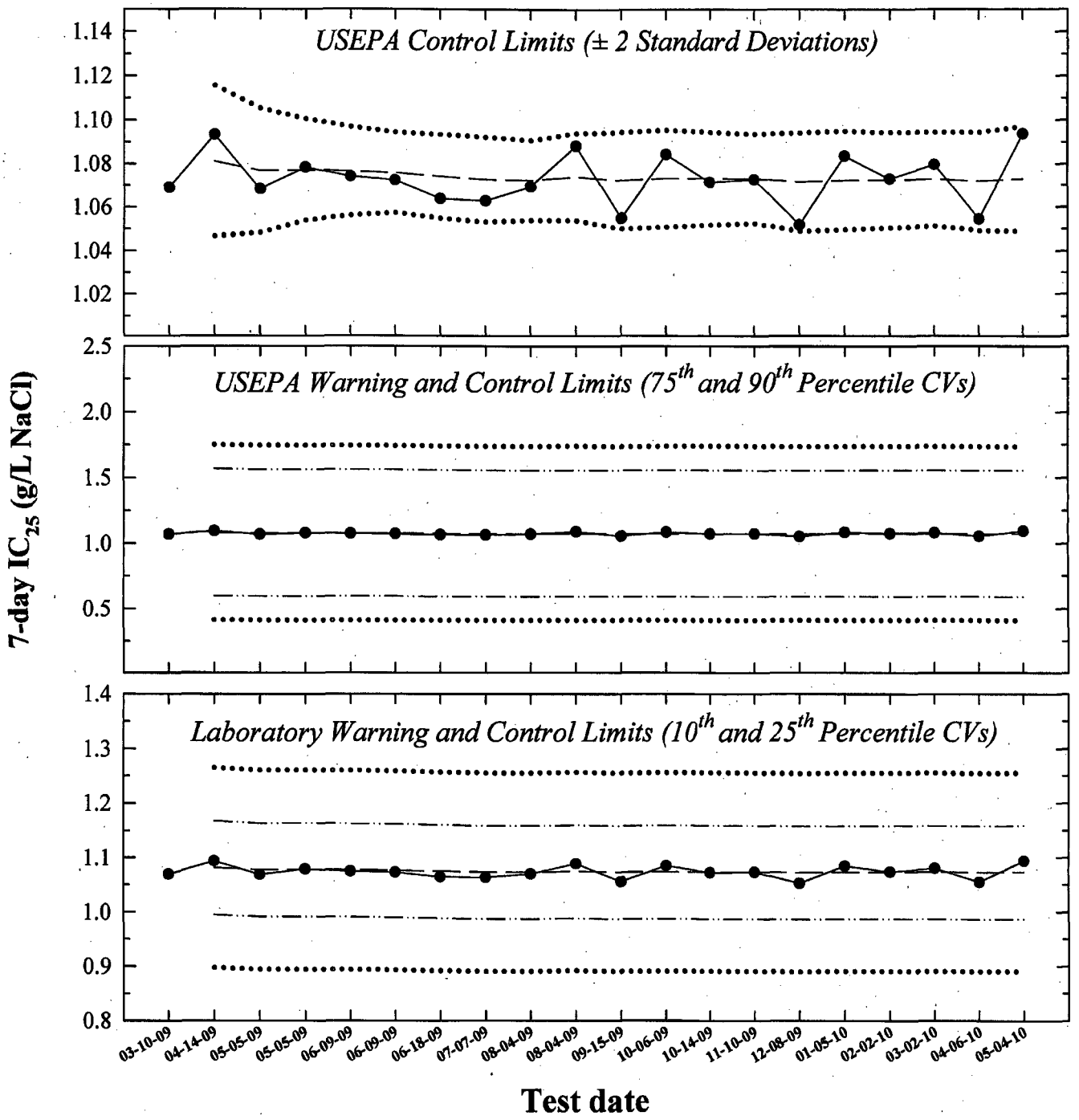
ETS
Environmental Testing Solutions, Inc.

Species: ***Pimephales promelas*** PpKClCR Test Number: 204

		Day							
		3		4		5		6	
	Analyst	KWL	LAB	LAB	BSC	BSC	BLS	BLS	BLS
Concentration	Parameter								
CONTROL	pH (S.U.)	7.41	7.51	7.61	7.57	7.59	7.52	7.64	7.52
	DO (mg/L)	7.9	7.7	7.7	8.0	8.1	7.8	7.8	7.6
	Conductivity (µmhos/cm)	324		332		336		336	
	Alkalinity (mg $CaCO_3$/L)			64		62			
	Hardness (mg $CaCO_3$/L)			94		94			
	Temperature (°C)	24.7	24.6	24.8	24.2	24.6	24.2	24.8	24.3
450 mg KCl/L	pH (S.U.)	7.57	7.50	7.68	7.64	7.72	7.57	7.72	7.54
	DO (mg/L)	8.0	7.5	7.6	8.0	8.1	7.7	7.7	7.6
	Conductivity (µmhos/cm)	1120		1150		1150		1150	
	Temperature (°C)	24.7	24.7	24.8	24.1	24.6	24.5	24.7	24.3
600 mg KCl/L	pH (S.U.)	7.60	7.59	7.70	7.65	7.72	7.61	7.72	7.59
	DO (mg/L)	8.0	7.5	7.7	8.0	8.1	7.7	7.7	7.6
	Conductivity (µmhos/cm)	1370		1420		1410		1420	
	Temperature (°C)	24.7	24.5	24.9	24.1	24.5	24.3	24.7	24.2
750 mg KCl/L	pH (S.U.)	7.62	7.61	7.72	7.66	7.74	7.64	7.73	7.61
	DO (mg/L)	8.1	7.5	7.8	8.0	8.1	7.8	7.7	7.7
	Conductivity (µmhos/cm)	1630		1680		1670		1680	
	Temperature (°C)	24.7	24.5	24.9	24.2	24.6	24.3	24.7	24.2
900 mg KCl/L	pH (S.U.)	7.64	7.63	7.73	7.65	7.74	7.65	7.72	7.63
	DO (mg/L)	8.2	7.6	7.7	7.9	8.1	7.8	7.7	7.7
	Conductivity (µmhos/cm)	1890		1960		1940		1960	
	Temperature (°C)	24.8	24.5	24.9	24.2	24.6	24.3	24.7	24.4
1050 mg KCl/L	pH (S.U.)	7.65	7.65	7.74	7.65	7.74	7.66	7.75	7.64
	DO (mg/L)	8.2	7.7	7.9	8.0	8.1	7.8	7.7	7.7
	Conductivity (µmhos/cm)	2170		2230		2200		2200	
	Temperature (°C)	24.8	24.4	24.9	24.2	24.6	24.3	24.7	24.3
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart



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

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

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

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

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart

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

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

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

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

Laboratory Control and Warning Limits

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

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

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

USEPA Control and Warning Limits

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

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

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

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

Page 88 of 99

Environmental Testing Solutions, Inc.

Precision of Endpoint Measurements

Ceriodaphnia dubia
Chronic Reference Toxicant Data

Test number	Test date	Control Survival (%)	Control Mean Reproduction (offspring/female)	CT for Control Mean Reproduction (offspring/female)	CV (%)	CT for Control Reproduction CV (%)	MSD	PMSD (%)	CT for PMSD (%)
1	03-10-09	100	31.9		5.8		2.6	8.2	
2	04-14-09	100	33.9	32.9	6.7	6.3	2.0	5.8	7.0
3	05-05-09	100	33.6	33.1	4.3	5.6	2.3	6.8	6.9
4	05-05-09	100	34.6	33.5	7.7	6.1	2.2	6.5	6.8
5	06-09-09	100	31.3	33.1	6.4	6.2	2.1	6.7	6.8
6	06-09-09	100	31.1	32.7	9.4	6.7	2.6	8.3	7.0
7	06-18-09	100	32.3	32.7	7.3	6.8	1.9	5.8	6.9
8	07-07-09	100	29.9	32.3	3.3	6.4	2.2	7.2	6.9
9	08-04-09	100	30.4	32.1	4.7	6.2	2.2	7.3	7.0
10	08-04-09	100	32.0	32.1	5.1	6.1	2.2	6.9	7.0
11	09-15-09	100	31.6	32.1	5.4	6.0	2.2	7.0	7.0
12	10-06-09	100	31.4	32.0	4.3	5.9	2.4	7.6	7.0
13	10-14-09	100	33.3	32.1	3.5	5.7	2.6	7.7	7.1
14	11-10-09	100	34.0	32.2	6.2	5.7	2.6	7.7	7.1
15	12-08-09	100	35.2	32.4	4.6	5.7	2.0	5.8	7.0
16	01-05-10	100	31.1	32.4	5.8	5.7	2.3	7.3	7.0
17	02-02-10	100	31.9	32.3	3.5	5.5	2.6	8.3	7.1
18	03-02-10	100	31.0	32.3	6.3	5.6	2.4	7.7	7.1
19	04-06-10	100	32.7	32.3	6.3	5.6	2.4	7.4	7.2
20	05-04-10	100	31.0	32.2	4.6	5.6	2.3	7.4	7.2

Note:

CV = Coefficient of variation for control reproduction.
Lower CV bound determined by USEPA (10th percentile) = 8.9%.
Upper CV bound determined by USEPA (90th percentile) = 42%

MSD = Minimum Significant Difference

PMSD = Percent Minimum Significant Difference
PMSD is a measure of test precision. The PMSD is the minimum percent difference between the control and treatment that can be declared statistically significant in a whole effluent toxicity test.
Lower PMSD bound determined by USEPA (10th percentile) = 13%.
Upper PMSD bound determined by USEPA (90th percentile) = 47%.

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

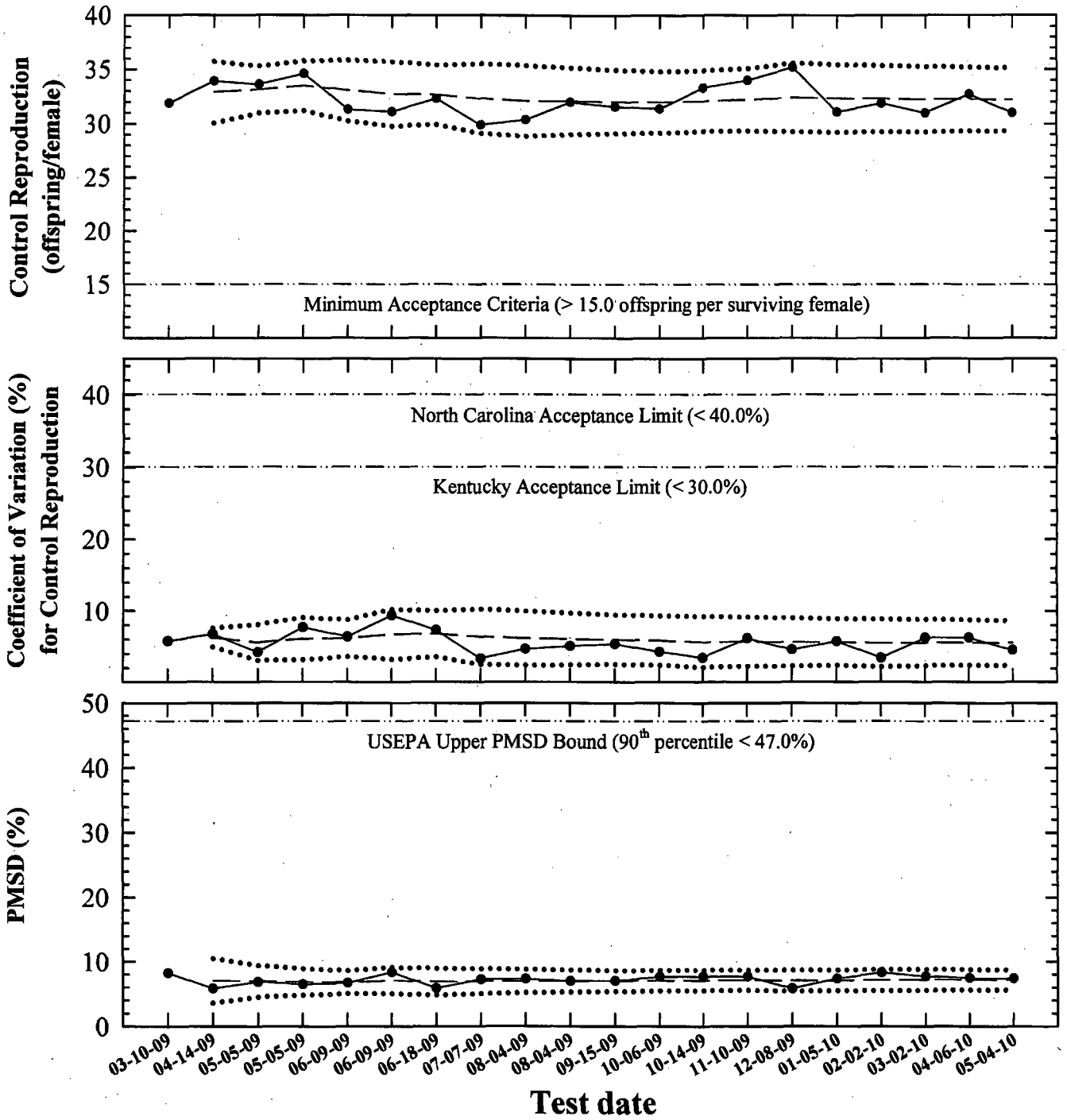
USEPA. 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination Program. EPA-833-R-00-003. US Environmental Protection Agency, Cincinnati, OH.

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

CdNaClCR_050410

Environmental Testing Solutions, Inc.

Ceriodaphnia dubia
Chronic Reference Toxicant Control Chart
Precision of Endpoint Measurements



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

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

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

ETS Environmental Testing Solutions, Inc.

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

CdNaClCR #: 106

Dilution preparation information:						***Comments:***
NaCl Stock INSS number:		INSS 809				
Stock preparation:		100 g NaCl/L: Dissolve 50 g NaCl in 500 mL Milli-Q water.				
Dilution prep (mg/L)	600	800	1000	1200	1400	
Stock volume (mL)	9	12	15	18	21	
Diluent volume (mL)	1491	1488	1485	1482	1479	
Total volume (mL)	1500	1500	1500	1500	1500	

Test organism source information:											***Test information:***	
Organism age:	< 24-hours old										Randomizing template color:	GOLD
Date and times organisms were born between:	05-04-10 0655 TO 0900										Incubator number and shelf location:	2B1
Culture board:	04-27-10A											
Replicate number:	1	2	3	4	5	6	7	8	9	10	YWT batch:	04-08-10
Culture board cup number:	5	7	9	11	15	16	17	21	23	24		
Transfer vessel information:	pH = 7.73 S.U. Temperature = 24.9 °C										*Selenastrum* batch:	04-30-10
Average transfer volume (mL):	0.0263 mL											

Daily renewal information:

Day	Date	Test initiation and feeding, renewal and feeding, or termination time	MHSW batch used	Analyst
0	05-04-10	0908	04-30-10B	JH
1	05-05-10	0810	04-30-10B	JH
2	05-06-10	0811	05-04-10B	JH
3	05-07-10	0810	05-04-10B	JH
4	05-08-10	0813	05-06-10	JH
5	05-09-10	0810	05-06-10	JH
6	05-10-10	0811	05-06-10	JH
7	05-11-10	0810		JH

Control information:		Acceptance criteria	***Summary of test endpoints:***	
% of Male Adults:	0%	≤ 20%	7-day LC_{50}	>1400
% Adults having 3rd Broods:	100%	≥ 80%	NOEC	800
% Mortality:	0%	≤ 20%	LOEC	1000
Mean Offspring/Female:	31.0	≥ 15.0 offspring/female	ChV	894.4
% CV:	4.6%	< 40.0 %	IC_{25}	1093.7

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 106

CONTROL ***Survival and Reproduction Data***

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

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.0

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

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

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.6
% Reduction from Control:	-1.9%

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 106

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

Day		Replicate number 1	2	3	4	5	6	7	8	9	10
1	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
2	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
3	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
4	Young produced	5	3	5	4	4	4	5	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	12	12	10	11	13	11	12	12	12	10
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	17	16	16	13	17	18	14	14	17
Total young produced		32	32	31	31	30	32	35	30	30	31
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	31.4
% Reduction from Control:	-1.3%

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	3	3	3	5	3	4	4	4	4
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	10	12	9	10	10	10	11	9	12	12
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	0	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	15	18	15	16	13	14	12	16	12	14
Total young produced		29	33	27	29	28	27	27	29	28	30
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	28.7
% Reduction from Control:	7.4%

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 106

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	2	2	3	3	4	4	2	2	2
	Adult mortality	L	L	L	L	L	L	L	L	L	L
5	Young produced	8	5	5	7	10	6	0	10	5	8
	Adult mortality	L	L	L	L	L	L	L	L	L	L
6	Young produced	0	0	0	0	0	0	10	0	0	0
	Adult mortality	L	L	L	L	L	L	L	L	L	L
7	Young produced	8	10	5	7	4	9	12	9	5	5
Total young produced		20	17	12	17	17	19	26	21	12	15
Final Adult Mortality		L	L	L	L	L	L	L	L	L	L

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	17.6
% Reduction from Control:	43.2%

1400 mg NaCl/L ***Survival and Reproduction Data***

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

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

Concentration:	
% Mortality:	0%
Mean Offspring/Female:	4.9
% Reduction from Control:	84.2%

Environmental Testing Solutions, Inc.

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

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

Test number: CdNaClCR #106
Test dates: May 04-11, 2010
Reveiwed by:

Concentration (mg/L NaCl)	Replicate number										Survival (%)	Average reproduction (offspring/female)	Coefficient of variation (%)	Percent reduction from control (%)
	1	2	3	4	5	6	7	8	9	10				
Control	32	32	30	30	33	29	32	29	31	32	100	31.0	4.6	Not applicable
600	34	32	31	32	31	30	31	31	31	33	100	31.6	3.7	-1.9
800	32	32	31	31	30	32	35	30	30	31	100	31.4	4.8	-1.3
1000	29	33	27	29	28	27	27	29	28	30	100	28.7	6.4	7.4
1200	20	17	12	17	17	19	26	21	12	15	100	17.6	24.0	43.2
1400	7	4	1	4	4	6	5	5	7	6	100	4.9	36.6	84.2

Dunnett's MSD value: 2.288
PMSD: 7.4

MSD = Minimum Significant Difference
PMSD = Percent Minimum Significant Difference

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

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

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

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

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

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/4/2010	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/11/2010	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	32.000	32.000	30.000	30.000	33.000	29.000	32.000	29.000	31.000	32.000
600	34.000	32.000	31.000	32.000	31.000	30.000	31.000	31.000	31.000	33.000
800	32.000	32.000	31.000	31.000	30.000	32.000	35.000	30.000	30.000	31.000
1000	29.000	33.000	27.000	29.000	28.000	27.000	27.000	29.000	28.000	30.000
1200	20.000	17.000	12.000	17.000	17.000	19.000	26.000	21.000	12.000	15.000
1400	7.000	4.000	1.000	4.000	4.000	6.000	5.000	5.000	7.000	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	31.000	1.0000	31.000	29.000	33.000	4.562	10			31.333	1.0000
600	31.600	1.0194	31.600	30.000	34.000	3.715	10	114.00	75.00	31.333	1.0000
800	31.400	1.0129	31.400	30.000	35.000	4.795	10	108.50	75.00	31.333	1.0000
*1000	28.700	0.9258	28.700	27.000	33.000	6.372	10	70.50	75.00	28.700	0.9160
*1200	17.600	0.5677	17.600	12.000	26.000	23.987	10	55.00	75.00	17.600	0.5617
*1400	4.900	0.1581	4.900	1.000	7.000	36.571	10	55.00	75.00	4.900	0.1564

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.890369	1.035	0.62537854	4.07545315
Bartlett's Test indicates unequal variances (p = 4.77E-04)	22.2131653	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	918.987342	31.6875687	861.4625	985.564423	0.5821
IC10	1009.00901	16.6380586	963.25	1025.13816	-0.9637
IC15	1037.23724	10.3476841	1016.68642	1055.4655	0.3765
IC20	1065.46547	11.473116	1044.96121	1089.83315	0.9599
IC25	1093.69369	13.6658949	1072.20238	1125.38548	1.3582
IC40	1178.37838	18.9439593	1145.54695	1217.24402	0.4973
IC50	1230.44619	16.3902417	1192.18208	1260.74352	-0.1532

ETS
Environmental Testing Solutions, Inc.

Statistical Analyses

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date:	5/4/2010	Test ID:	CdNaClCR	Sample ID:	REF-Ref Toxicant
End Date:	5/11/2010	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	32.000	32.000	30.000	30.000	33.000	29.000	32.000	29.000	31.000	32.000
600	34.000	32.000	31.000	32.000	31.000	30.000	31.000	31.000	31.000	33.000
800	32.000	32.000	31.000	31.000	30.000	32.000	35.000	30.000	30.000	31.000
1000	29.000	33.000	27.000	29.000	28.000	27.000	27.000	29.000	28.000	30.000
1200	20.000	17.000	12.000	17.000	17.000	19.000	26.000	21.000	12.000	15.000
1400	7.000	4.000	1.000	4.000	4.000	6.000	5.000	5.000	7.000	6.000

			Transform: Untransformed						1-Tailed	
Conc-mg/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	31.000	1.0000	31.000	29.000	33.000	4.562	10			
600	31.600	1.0194	31.600	30.000	34.000	3.715	10	-0.600	2.287	2.288
800	31.400	1.0129	31.400	30.000	35.000	4.795	10	-0.400	2.287	2.288
*1000	28.700	0.9258	28.700	27.000	33.000	6.372	10	2.299	2.287	2.288
*1200	17.600	0.5677	17.600	12.000	26.000	23.987	10	13.395	2.287	2.288
*1400	4.900	0.1581	4.900	1.000	7.000	36.571	10	26.090	2.287	2.288

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.890369	1.035	0.62537854	4.07545315
Bartlett's Test indicates unequal variances (p = 4.77E-04)	22.2131653	15.0862722		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	800	1000	894.427191		2.28751339	0.07379075	1178.28	5.0037037	2.3E-35	5, 54
Treatments vs D-Control										

Analysis used for PMSD calculation only.

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** **CdNaClCR #:** 106

Daily Chemistry:

		Day					
		0		1		2	
	Analyst	[illegible]	KEN	KEN	BCS	BCS	KEN
Concentration	Parameter						
CONTROL	pH (S.U.)	7.59	7.55	7.65	7.54	7.51	7.42
	DO (mg/L)	7.9	7.9	7.8	7.9	8.0	7.7
	Conductivity (µmhos/cm)	320		328		324	
	Alkalinity (mg $CaCO_3$/L)	64				64	
	Hardness (mg $CaCO_3$/L)	94				94	
	Temperature (°C)	24.9	25.0	25.2	24.9	25.1	24.6
600 mg NaCl/L	pH (S.U.)	7.72	7.67	7.69	7.68	7.68	7.61
	DO (mg/L)	8.0	7.9	7.9	7.9	8.1	8.0
	Conductivity (µmhos/cm)	1430		1490		1450	
	Temperature (°C)	24.8	25.0	25.2	24.9	25.1	24.7
800 mg NaCl/L	pH (S.U.)	7.72	7.69	7.70	7.68	7.68	7.65
	DO (mg/L)	8.0	7.9	7.9	7.9	8.1	8.0
	Conductivity (µmhos/cm)	1780		1830		1820	
	Temperature (°C)	24.8	25.2	25.2	24.8	25.1	24.7
1000 mg NaCl/L	pH (S.U.)	7.72	7.72	7.74	7.71	7.67	7.66
	DO (mg/L)	7.9	7.8	7.9	7.8	8.1	8.0
	Conductivity (µmhos/cm)	2160		2220		2210	
	Temperature (°C)	25.0	25.0	25.1	24.8	25.0	24.8
1200 mg NaCl/L	pH (S.U.)	7.73	7.72	7.73	7.71	7.68	7.67
	DO (mg/L)	8.0	7.9	7.9	7.9	8.2	8.1
	Conductivity (µmhos/cm)	2500		2590		2510	
	Temperature (°C)	25.0	24.9	25.1	24.8	25.2	24.8
1400 mg NaCl/L	pH (S.U.)	7.74	7.74	7.73	7.74	7.72	7.67
	DO (mg/L)	8.0	7.9	7.9	7.8	8.2	8.1
	Conductivity (µmhos/cm)	2860		2960		2880	
	Temperature (°C)	24.9	24.9	25.2	25.1	25.0	24.7
STOCK	Conductivity (µmhos/cm)	101000					
		Initial	Final	Initial	Final	Initial	Final

ETS Environmental Testing Solutions, Inc.

Species: ***Ceriodaphnia dubia*** CdNaClCR #: 106

		Day							
		3		4		5		6	
	Analyst	BSL	LAB	LAB	BSL	BSL	BCS	BCS	BCS
Concentration	Parameter								
CONTROL	pH (S.U.)	7.49	7.63	7.59	7.69	7.65	7.52	7.43	7.52
	DO (mg/L)	7.6	7.8	7.8	8.2	~~7.6~~ 7.8	7.9	7.6	7.7
	Conductivity (µmhos/cm)	323		329		*363		337	
	Alkalinity (mg $CaCO_3$/L)			58					
	Hardness (mg $CaCO_3$/L)			94					
	Temperature (°C)	24.8	24.9	24.6	24.8	24.8	25.2	24.9	24.9
600 mg NaCl/L	pH (S.U.)	7.65	7.78	7.77	7.83	7.86	7.64	7.65	7.64
	DO (mg/L)	7.8	7.7	8.2	8.1	~~7.6~~ 8.0	7.9	7.8	7.7
	Conductivity (µmhos/cm)	1480		1500		*1580		1540	
	Temperature (°C)	24.9	25.0	24.6	25.1	24.8	24.8	24.9	25.0
800 mg NaCl/L	pH (S.U.)	7.65	7.81	7.79	7.83	7.89	7.68	7.69	7.69
	DO (mg/L)	7.9	7.8	8.0	8.1	8.0	7.8	7.8	7.7
	Conductivity (µmhos/cm)	1830		1850		*1970		1830	
	Temperature (°C)	24.7	25.0	24.6	25.0	24.8	24.8	24.9	25.0
1000 mg NaCl/L	pH (S.U.)	7.66	7.81	7.82	7.86	7.89	7.68	7.70	7.70
	DO (mg/L)	7.9	7.5	7.9	8.0	8.1	7.8	7.9	7.7
	Conductivity (µmhos/cm)	2220		2240 ~~2224~~		*2370		2330	
	Temperature (°C)	24.7	24.8	24.6	25.2	24.8	24.8	25.0	25.1
1200 mg NaCl/L	pH (S.U.)	7.69	7.84	7.85	7.86	7.89	7.68	7.73	7.71
	DO (mg/L)	8.0	7.7	8.0	8.1	8.1	7.9	7.9	7.7
	Conductivity (µmhos/cm)	2570		2580		*2780		2590	
	Temperature (°C)	24.7	24.8	24.6	25.2	24.8	24.7	25.0	25.1
1400 mg NaCl/L	pH (S.U.)	7.70	7.85	7.87	7.86	7.94	7.71	7.77	7.72
	DO (mg/L)	7.9	7.7	8.2	8.1	8.1	7.9	8.0	~~7.8~~ 7.8
	Conductivity (µmhos/cm)	2950		2970		*3190		2990	
	Temperature (°C)	24.7	24.8	24.6	25.2	24.8	25.0	25.0	24.9
		Initial	Final	Initial	Final	Initial	Final	Initial	Final

* HIGH CELL CONSTANT FOR CONDUCTIVITY RESULTED IN HIGHER VALUES. - DAY 5