



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

January 9, 2002

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

Attention: Ms. Evelyn Haskin, Enforcement & Compliance

Dear Ms. Haskin:

TENNESSEE VALLEY AUTHORITY - DISCHARGE MONITORING REPORT FOR
SEQUOYAH NUCLEAR PLANT (SQN)

Please find enclosed the Discharge Monitoring Report (DMR) of December 2001 for SQN. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

A handwritten signature in cursive script that reads "Diedre B. Nida".

Diedre B. Nida
Environmental Supervisor
Signatory Authority
for Richard T. Purcell
Vice President
Sequoyah Nuclear Plant

Enclosures: 2 (original & copy)

cc (Enclosure):

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

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

IB 25

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

DISCHARGE MONITORING REPORT (DMR) (2-16) (17-19)

TN0026450 101 G
PERMIT NUMBER DISCHARGE NUMBER

(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

OMB No. 2040-0004
Approval expires 05-31-98

MONITORING PERIOD
From YEAR MO DAY To YEAR MO DAY
01 12 01 01 12 31
(20-21) (22-23) (24-25) (26-27) (28-29) (30-31)

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only (46-53)) QUANTITY OR LOADING (54-61)			(4 Card Only (38-45)) QUALITY OR CONCENTRATION (46-53)			UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM				
TEMPERATURE, WATER DEG. CENTIGRADE 00010 Z 0 0 INSTREAM MONITORING	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	17.7	(04)	0	31 / 31	MODEL
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE 00010 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	30.3	(04)	0	31 / 31	RCORDR
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
PH 00400 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	7.3	*****	7.8	(12)	0	8 / 31	GRAB
	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	5	8	(19)	0	4 / 31	GRAB
	PERMIT REQUIREMENT	*****	*****	****	*****	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE 00556 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	<5	<5	(19)	0	4 / 31	GRAB
	PERMIT REQUIREMENT	*****	*****	****	*****	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	1622	(03)	*****	*****	*****	**	0	31 / 31	RCORDR
	PERMIT REQUIREMENT	*****	REPORT DAILY MX	MGD	*****	*****	*****	****		CONTIN UOUS	RCORDR
CHLORINE, TOTAL RESIDUAL 50060 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	<0.007	0.014	(19)	0	41 / 31	GRAB
	PERMIT REQUIREMENT	*****	*****	****	*****	0.036	0.058 INST MAX	MG/L		WEEK- DAYS	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
		AREA CODE	NUMBER	YEAR	MO	DAY
Richard T. Purcell Site Vice President	SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	423	843-6700	02	01	10
TYPED OR PRINTED						

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

No closed mode operation. The following injections occurred: 1. PCL-222 (max. calc. conc. was 0.025mg/L--limit 0.100mg/L) 2. CL-363 (max. calc. conc. was 0.008mg/L--limit 0.100mg/L) 3. PCL-222/PCL-401 (max. calc. conc. was 0.02mg/L--limit 0.100mg/L)

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

DISCHARGE MONITORING REPORT (LJMH)
(2-16) (17-19)

TN0026450 101 G
PERMIT NUMBER DISCHARGE NUMBER

(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

OMB No. 2040-0004
Approval expires 05-31-98

MONITORING PERIOD
From YEAR 01 MO 12 DAY 01 To YEAR 01 MO 12 DAY 31
(20-21) (22-23) (24-25) (26-27) (28-29) (30-31)

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only (46-53)) QUANTITY OR LOADING (54-61)			(4 Card Only (38-45)) QUALITY OR CONCENTRATION (46-53) (54-61)				NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE - C, RATE OF CHANGE 82234 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	0.3	(04)	0	31 / 31	CALCTD
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	2.0	DEG. C.			CALCTD
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C 00016 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****	2.7	(04)	0	31 / 31	CALCTD
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	5.0	DEG. C.			CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
BORON, TOTAL 01022 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	<0.2	<0.2	<0.2	(19)	0	1 / 31	GRAB
	PERMIT REQUIREMENT	*****	*****	****	REPORT	REPORT	REPORT	MG/L			GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER Richard T. Purcell Site Vice President TYPED OR PRINTED	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
		423	843-6700	02	01	10
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		AREA CODE	NUMBER	YEAR	MO	DAY

Diedre B. Nida
Environmental Supervisor

TELEPHONE
423 843-6700
AREA CODE NUMBER
DATE
02 01 10
YEAR MO DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
CCW data for December 2001 is attached.

CCW Data for December 2001

CCW CHANNEL

DATE	DIESEL RANGE ORGANICS (mg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
12/05/01	< 0.1	< 1	
12/19/01	0.6	<1	Backup samples sent to the lab for DRO.

CCW TRENCH DISCHARGE

DATE	DIESEL RANGE ORGANICS (mg/L)	TOTAL PETROLEUM HYDROCARBONS (mg/L)	COMMENTS
12/05/01	0.67	< 1	
12/19/01	0.51	<1	Backup samples sent to the lab for DRO.

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

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 (INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
 Facility **TVA - SEQUOYAH NUCLEAR PLANT**
 Location **HAMILTON COUNTY**

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(2-16)

(17-19)

TN0026450
 PERMIT NUMBER

101 T
 DISCHARGE NUMBER

MAJOR

(SUBR 01)

F - FINAL

DIFFUSER DISCHARGE

EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.

OMB No. 2040-0004

Approval expires 05-31-98

MONITORING PERIOD

YEAR	MO	DAY	YEAR	MO	DAY
01	10	01	01	12	31

From

To

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only (46-53))			(4 Card Only (38-45))				NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	*****	*****	**	>100	*****	*****	(23)	0	1 / 92	GRAB
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QUART- ERLY	GRAB
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	*****	*****	**	INVALID	*****	*****	(23)		1/92	GRAB
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	43.9 MINIMUM	*****	*****	PERCENT		QUART- ERLY	GRAB
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
Richard T. Purcell Site Vice President		423	843-6700	02	01	10
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

Diedre B. Nida
 Environmental Supervisor

SIGNATURE OF PRINCIPAL EXECUTIVE
 OFFICER OR AUTHORIZED AGENT

TELEPHONE

DATE

423 843-6700

02 01 10

AREA
CODE

NUMBER

YEAR

MO

DAY

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

Toxicity was sampled from 11/25 to 11/30. The test was terminated due to a Fed-Ex delivery error. Toxicity was sampled 12/9 to 12/14. The test results were determined to be invalid. A repeat test was initiated from 1/2 to 1/7. The follow-up test results will be reported within 30 days of test invalidation, according to the permit requirements. A detailed explanation and the report are attached.

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

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SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(2-16)

(17-19)

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
01	12	01	01	12	31

From

To

MAJOR

(SUBR 01)

F - FINAL

LOW VOL. WASTE TREATMENT POND

EFFLUENT

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		QUANTITY OR LOADING (3 Card Only (46-53) (54-61))			QUALITY OR CONCENTRATION (4 Card Only (38-45) (46-53) (54-61))			NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM			
PH	SAMPLE MEASUREMENT	*****	*****	**	7.0	*****	8.7	0	13 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	**	6.0 MINIMUM	*****	9.0 MAXIMUM		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	98	132	(26)	*****	10	13	0	4 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	*****	30 MO AVG	100 DAILY MX		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<50	<52	(26)	*****	<5	<5	0	4 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	*****	15 MO AVG	20 DAILY MX		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.163	1.246	(03)	*****	*****	*****	0	31 / 31	TOTAL
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****		DAILY	TOTAL
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
Richard T. Purcell		423	843-6700	02	01	10
Site Vice President		AREA CODE	NUMBER	YEAR	MO	DAY
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

Diedrich
Environmental Supervisor

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

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

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)
(2-16) (17-19)
TN0026450 **107 G**
PERMIT NUMBER DISCHARGE NUMBER

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

Form Approved.
OMB No. 2040-0004
Approval expires 05-31-98

MONITORING PERIOD
From **01 12 01** To **01 12 31**
(20-21) (22-23) (24-25) (26-27) (28-29) (30-31)

*** NO DISCHARGE ☒ ***

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only (46-53) QUANTITY OR LOADING (54-61)			(4 Card Only (38-45) QUALITY OR CONCENTRATION (46-53) (54-61)				NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
PH	SAMPLE MEASUREMENT	*****	*****	**		*****		(12)			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	6.0 MINIMUM	*****	9.0 MAXIMUM	SU		DAILY	GRAB
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMP-8
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	30 DAILY MX	MG/L		DAILY	COMP-8
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMP-8
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 DAILY MX	MG/L		DAILY	COMP-8
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	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
Richard T. Purcell		423	843-6700	02	01	10
Site Vice President				YEAR	MO	DAY
TYPED OR PRINTED		AREA CODE	NUMBER			

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
No phosphate bearing chemicals were employed. No Discharge this Period

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

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

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

(2-16) (17-19)

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD					
YEAR	MO	DAY	YEAR	MO	DAY
01	12	01	01	12	31

From

To

MAJOR

(SUBR 01)

F - FINAL

RECYCLED COOLING WATER

EFFLUENT

*** NO DISCHARGE ☒ ***

NOTE: Read instructions before completing this form.

ATTN: Dledre B. Nida

PARAMETER (32-37)		QUANTITY OR LOADING (3 Card Only (46-53) (54-61))			QUALITY OR CONCENTRATION (4 Card Only (38-45) (46-53) (54-61))				NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		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	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	15 DAILY MX	MG/L		DAILY	GRAB
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 DAILY MX	MG/L		DAILY	GRAB
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 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	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	GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
Richard T. Purcell		423	843-6700	02	01	10
Site Vice President						
TYPED OR PRINTED		AREA CODE	NUMBER	YEAR	MO	DAY

Diedre B. Nida
 Environmental Supervisor

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

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

No Discharge this Period

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

DISCHARGE MONITORING REPORT (17-19)
(2-16)
TN0026450 118 G
PERMIT NUMBER DISCHARGE NUMBER

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

OMB No. 2040-0004
Approval expires 05-31-98

MONITORING PERIOD
From YEAR 01 MO 12 DAY 01 To YEAR 01 MO 12 DAY 31
(20-21) (22-23) (24-25) (26-27) (28-29) (30-31)

*** NO DISCHARGE ☒ ***

NOTE: Read instructions before completing this form.

PARAMETER (32-37)		(3 Card Only (46-53) QUANTITY OR LOADING (54-61)			(4 Card Only (38-45) QUALITY OR CONCENTRATION (46-53) (54-61)			NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM			
OXYGEN, DISSOLVED (DO) 00300 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**		*****	*****	(19)		
	PERMIT REQUIREMENT	*****	*****	****	2.0 DAILY MN	*****	*****	MG/L	TWICE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED 00530 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(19)		
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	100 DAILY MX	MG/L	TWICE/ WEEK	GRAB
SOLIDS, SETTLEABLE 00545 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT	*****	*****	**	*****	*****		(25)		
	PERMIT REQUIREMENT	*****	*****	****	*****	*****	1.0 DAILY MX	ML/L	ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT 50050 1 0 0 EFFLUENT GROSS VALUE	SAMPLE MEASUREMENT			(03)	*****	*****	*****	**		
	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	*****	*****	*****	*	ONCE/ BATCH	CALCTD
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									
	SAMPLE MEASUREMENT									
	PERMIT REQUIREMENT									

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. §1001 AND 33 U.S.C. §1319. (Penalties under these statutes may include fines up to \$10,000 and or maximum imprisonment of between 6 months and 5 years.)	TELEPHONE		DATE		
		AREA CODE	NUMBER	YEAR	MO	DAY
Richard T. Purcell Site Vice President TYPED OR PRINTED		423	843-6700	02	01	10
		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT				

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

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

January 8, 2002

Diedre B. Nida, SB 2A-SQN

SEQUOYAH NUCLEAR PLANT (SQN) TOXICITY BIOMONITORING, NPDES PERMIT NO. TN0026450, NOVEMBER AND DECEMBER 2001

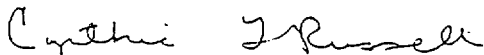
Attached are two copies of the subject report for submission to the state of Tennessee with the DMR package. The report provides results of compliance testing using daphnids only due to invalidation of the concurrent fathead minnow test. I have also included a copy of the report for your records.

SQN Outfall 101 samples collected December 9-14 were not toxic to daphnids (IC_{25} value > 43.9 percent). Although the fathead minnow test "passed" using either point estimate or hypothesis test statistical analyses (i.e., IC_{25} = 75 percent and NOEC = 100 percent), the test had low statistical sensitivity due to the anomalous dose response and highly variable survival among replicates within treatments, which appeared to be related to the intake water (intake survival = 40 percent). Exposure of fathead minnows to intake samples resulted in statistically significant reductions for both survival and growth. No intake toxicity to daphnids was demonstrated.

Permit language allowing data review according to current EPA procedures showed that the point estimate (IC_{25}) was the correct test endpoint for compliance determination, but that the percent minimum significant difference for the test exceeded the EPA recommended range for test sensitivity. Using this rationale, the test was ruled invalid and a repeat test was initiated January 4, 2002. Since results from the December test showed symptoms typical of pathogen interference associated with the intake water, the follow-up test also includes a parallel test using samples treated by exposure to UV light to eliminate pathogen interference, if present. Bench sheets from the invalid test are presented in Appendix E. The follow-up tests will be reported within 30 days of test invalidation, according to the permit requirements. Test invalidation and follow-up test schedule were agreed upon in email and phone messages between Jennifer Moses, TVA, and Chris Moran, TDEC, on December 20 and 21, 2001.

The first attempt to conduct SQN fourth quarter biomonitoring was initiated on November 27, 2001. These tests were terminated on December 1 (Day 4) due to failure by FedEx to deliver weekend samples. Bench sheets for these tests are presented in Appendix F.

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):

Files, ER&TA, CEB 1B-M

**TENNESSEE VALLEY AUTHORITY
TOXICITY TEST REPORT**

INTRODUCTION/EXECUTIVE SUMMARY

- 1) Facility/Discharger: Sequoyah Nuclear Plant/TVA Report Date: January 8, 2002
- 2) County/State: Hamilton/Tennessee 3) NPDES Permit #: TN0026450
- 4) Type of Facility: Nuclear-fueled electric generating plant
- 5) Design Flow (MGD): 3,266
- 6) Receiving Stream: Tennessee River (TRM 483.6) 7) 1Q20: 2,992.4
- 8) Outfall Tested: 101 9) Dates Sampled: December 9-14, 2001
- 10) Flow on day(s) sampled (MGD): 1600, 1605, 1599, 1598, 1605, 1589
- 11) Pertinent site conditions: No unusual conditions reported.*
- 12) Test Dates: December 10-17, 2001 13) Test Type: Short-term Chronic-definitive
- 14) Test Species: Fathead Minnows (*Pimephales promelas*)
Daphnids (*Ceriodaphnia dubia*)
- 15) Concentrations Tested (%): Outfall 101 10.98 22 43.9 72 100
Intake 100
- 16) Permit Limit Endpoint (%): Outfall 101 IC₂₅ = 43.9
- 17) Test Results (%): Outfall 101
Pimephales promelas IC₂₅ = Test Invalid (See Appendix E)
Ceriodaphnia dubia IC₂₅ > 100
- 18) Facility Contact: Diedre B. Nida 19) Phone #: (423) 843-6700
- 20) Consultant/Testing Lab Name: S&ME Inc.
- 21) Lab Contact: Leira S. Douthat Phone #: (865)-970-0003
- 22) TVA Contact: Cynthia L. Russell Phone #: (256) 386-2755

*Production/operation data will be provided in the event toxicity exceeds permit limits/upon request.

23) Notes: SQN Outfall 101 samples collected December 9-14 were not toxic to daphnids (IC_{25} value > 43.9 percent). Although the fathead minnow test "passed" using either point estimate or hypothesis test statistical analyses (i.e., IC_{25} = 75 percent and NOEC = 100 percent), the test had low statistical sensitivity due to the anomalous dose response and highly variable survival among replicates within treatments, which appeared to be related to the intake water (intake survival = 40 percent). Exposure of fathead minnows to intake samples resulted in statistically significant reductions for both survival and growth. No intake toxicity to daphnids was demonstrated.

Permit language allowing data review according to current EPA procedures showed that the point estimate (IC_{25}) was the correct test endpoint for compliance determination, but that the percent minimum significant difference for the test exceeded the EPA recommended range for test sensitivity. Using this rationale, the test was ruled invalid and a repeat test was initiated January 4, 2002. Since results from the December test showed symptoms typical of pathogen interference associated with the intake water, the follow-up test also includes a parallel test using samples treated by exposure to UV light to eliminate pathogen interference, if present. Bench sheets from the invalid test are presented in Appendix E. The follow-up tests will be reported within 30 days of test invalidation, according to the permit requirements. Test invalidation and follow-up test schedule were agreed upon in email and phone messages between Jennifer Moses, TVA, and Chris Moran, TDEC, on December 20 and 21, 2001.

The first attempt to conduct SQN fourth quarter biomonitoring was initiated on November 27, 2001. These tests were terminated on December 1 (Day 4) due to failure by FedEx to deliver weekend samples. Bench sheets for these tests are presented in Appendix F.

METHODS SUMMARY

Samples

- 1) Sampling Point: Outfall 101 and Intake
- 2) Sample Type: Composite
- 3) Sample Information:

ID	Date/Time Collected (MM-DD/Time)	Date/Time Received (MM-DD/Time)	Arrival Temp. (°C)	Initial TRC* (mg/L)	Date/Time Used By (MM-DD/Time)
101 Intake	12/09-0922 to 12/10-0822	12/10/1232	0.3	0.07	12-10/1430
	12/09-0940 to 12/10-0840	12/10/1232	0.5	0.15	12-11/1500 12-10/1430 12-11/1500
101 Intake	12/11-0909 to 12/12-0809	12/12/1210	0.9	0.08	12-12/1445
	12/11-0926 to 12/12-0826	12/12/1210	1.4	0.06	12-13/1415 12-12/1445 12-13/1445
101 Intake	12/13-0826 to 12/14-0726	12/14/1235	2.0	0.07	12-14/1330
	12/13-0841 to 12/14-0741	12/14/1235	2.0	0.05	12-15/1330 12-16/1345 12-14/1330 12-15/1330 12-16/1345

*Total residual chlorine upon receipt.

- 4) Sample manipulation: Daily samples warmed to $25 \pm 1^\circ\text{C}$

Test Organisms

- | | | |
|------------|----------------------------|---------------------------|
| | <i>Pimephales promelas</i> | <i>Ceriodaphnia dubia</i> |
| 1) Source: | <u>In-house Culture</u> | <u>In-house Culture</u> |
| 2) Age: | <u>< 24 hours</u> | <u>< 24 hours</u> |

Test Method Summary (See Appendix A for additional information)

	<i>Pimephales promelas</i>	<i>Ceriodaphnia dubia</i>
1) Test Conditions	<u>N/A</u>	<u>Static, renewal</u>
2) Test Duration	<u>N/A</u>	<u>Until at least 60% of control females have 3 broods</u>
3) Dilution/Control Water	<u>N/A</u>	<u>20% Dilute minerals water and trace minerals</u>
4) Number Replicates	<u>N/A</u>	<u>10</u>
5) Animals per Replicate	<u>N/A</u>	<u>1</u>
6) Test Initiation	<u>N/A</u> (Date/Time)	<u>12-10-01/1430</u> (Date/Time)
7) Test Termination	<u>N/A</u> (Date/Time)	<u>12-17-01/1500</u> (Date/Time)
8) Test Temperature	Mean = <u>N/A</u>	Mean = <u>24.7°C</u> <u>(24.0°C-25.5°C)</u>
9) Physical/Chemical Measurements:	Hardness, alkalinity, total residual chlorine, and conductivity were measured at the laboratory in each 100 percent sample. Daily temperatures were measured in one replication per test concentration. Pre- and post-exposure test solutions were analyzed daily for pH and dissolved oxygen.	
10) Statistics:	Toxcalc software Version 5.0 was used for statistical analyses. Test data were reviewed for dose response, sensitivity, and validity following recent EPA guidance. [2] [3]	

2) Results of a Ceriodaphnia dubia Chronic/ 7 day (3-brood) Toxicity Test
(Genus) (Species) (Type/Duration)

Conducted 12/10/01 - 12/17/01 Using Effluent From Outfall 101.
(mm/dd/yy) (mm/dd/yy) (number)

Test Solutions	Percent Surviving (time intervals used – days)						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Control	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
10.98% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
22.0% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
43.9% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
72.0% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
100% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>
Intake	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

Test Solutions	Reproduction (# of young/female during test) Data Replicates										Mean
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	
Control	<u>28</u>	<u>31</u>	<u>22</u>	<u>26</u>	<u>24</u>	<u>26</u>	<u>24</u>	<u>24</u>	<u>28</u>	<u>24</u>	<u>25.7</u>
10.98% Effluent	<u>26</u>	<u>25</u>	<u>26</u>	<u>22</u>	<u>20</u>	<u>24</u>	<u>28</u>	<u>22</u>	<u>24</u>	<u>24</u>	<u>24.1</u>
22.0% Effluent	<u>30</u>	<u>24</u>	<u>30</u>	<u>23</u>	<u>28</u>	<u>28</u>	<u>28</u>	<u>23</u>	<u>29</u>	<u>25</u>	<u>26.8</u>
43.9% Effluent	<u>31</u>	<u>29</u>	<u>25</u>	<u>24</u>	<u>29</u>	<u>28</u>	<u>25</u>	<u>24</u>	<u>24</u>	<u>24</u>	<u>26.3</u>
72.0% Effluent	<u>24</u>	<u>27</u>	<u>29</u>	<u>27</u>	<u>22</u>	<u>23</u>	<u>24</u>	<u>23</u>	<u>23</u>	<u>23</u>	<u>24.5</u>
100% Effluent	<u>27</u>	<u>27</u>	<u>30</u>	<u>23</u>	<u>28</u>	<u>24</u>	<u>25</u>	<u>21</u>	<u>26</u>	<u>22</u>	<u>25.3</u>
Intake	<u>30</u>	<u>32</u>	<u>23</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>26</u>	<u>22</u>	<u>24</u>	<u>25</u>	<u>26.0</u>
IC ₂₅ Value: <u>> 100%</u>		Calculated TU Estimates [†] : <u><1.0 TU_c</u>									
95% Confidence Limits Upper Limit <u>NA</u> Lower Limit <u>NA</u>		Permit Limit: <u>2.3 TU_c</u>									

[†]NOTE: TU_a = 100/LC₅₀; TU_c = 100/ IC₂₅

REFERENCE TOXICANT TEST RESULTS (See Appendixes A and D)

Species	Date	Time	Duration	Toxicant	Results (LC ₅₀ /IC ₂₅)
<i>Ceriodaphnia dubia</i>	12/10/10	1530	7 days	NaCl	1.117 mg/L NaCl

PHYSICAL/CHEMICAL SUMMARY

- 1) Analysis of Sequoyah Nuclear Plant Diffuser Discharge Concentrations of Total Residual Chlorine
- 2) Diffuser Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling
- 3) Initial and Final Chemistry for Fathead Minnow 7-day and Daphnid 3-brood Chronic Tests.

See Summary Tables in Appendix B

SUMMARY/CONCLUSIONS

SQN Outfall 101 samples collected December 9-14 were not toxic to daphnids (IC_{25} value > 43.9 percent). Although the fathead minnow test "passed" using either point estimate or hypothesis test statistical analyses (i.e., IC_{25} = 75 percent and NOEC = 100 percent), the test had low statistical sensitivity due to the anomalous dose response and highly variable survival among replicates within treatments, which appeared to be related to the intake water (intake survival = 40 percent). Exposure of fathead minnows to intake samples resulted in statistically significant reductions for both survival and growth. No intake toxicity to daphnids was demonstrated.

Permit language allowing data review according to current EPA procedures showed that the point estimate (IC_{25}) was the correct test endpoint for compliance determination, but that the percent minimum significant difference for the test exceeded the EPA recommended range for test sensitivity. Using this rationale, the test was ruled invalid and a repeat test was initiated January 4, 2002. Since results from the December test showed symptoms typical of pathogen interference associated with the intake water, the follow-up test also includes a parallel test using samples treated by exposure to UV light to eliminate pathogen interference, if present. Bench sheets from the invalid test are presented in Appendix E. The follow-up tests will be reported within 30 days of test invalidation, according to the permit requirements. Test invalidation and follow-up test schedule were agreed upon in email and phone messages between Jennifer Moses, TVA, and Chris Moran, TDEC, on December 20 and 21, 2001.

Appendix A

ADDITIONAL TOXICITY TEST INFORMATION

SUMMARY OF METHODS

1) *Pimephales promelas*

Tests were conducted according to EPA/600/4-91/002 (July 1994) using four replicates, each containing ten test organisms, per treatment. Test vessels consisted of 500-mL polystyrene cups, each containing 250 mL of test solution. [4]

2) *Ceriodaphnia dubia*

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

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 S&ME laboratory instruments is recorded in calibration and maintenance log books.
- 3) Temperature was measured using a VWR Scientific digital NIST-traceable thermometer according to S&ME SOP. [5]
- 4) Dissolved oxygen was measured using a YSI Dissolved Oxygen meter. The instrument was calibrated and readings were made according to EPA Method 120.1.
- 5) The pH was measured using a VWR Scientific Symphony pH meter equipped with an Orion combination electrode. The instrument was calibrated and readings were made according to EPA Method 150.1.
- 6) Conductance was measured using an Orion conductivity meter. The instrument was calibrated and readings were taken according to manufacturers instructions.
- 7) Alkalinity was measured using Standard Methods Titration Method 2320 B using 0.01 N HCl to an endpoint pH of 4.5.
- 8) Hardness was measured using Standard Methods EDTA Titrimetric Method 2340 C or EPA Method 130.2.
- 9) Total residual chlorine was determined using the DPD Ferrous Titrimetric Method with a Hach colorimetric kit.

QUALITY ASSURANCE

Toxicity Test Methods: All phases of the study including, but not limited to, sample collection, handling and storage; glassware preparation; test organism culturing/acquisition and acclimation; test organism handling during test; and maintaining appropriate test conditions were conducted according to the protocol as described in this report and EPA/600/4-91/002. [4] 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 IC₂₅ values in g/L NaCl or g/L KCl.
- 2) Standard Toxicant: Sodium Chloride and Potassium Chloride (NaCl and KCl crystalline)
- 3) Dilution Water Used: Moderately hard water for fathead minnows and 20 percent DMW water for the *Ceriodaphnia dubia*.
- 4) Statistics: Toxcalc software Version 5.0 was used for statistical analyses.

REFERENCES

- 1) NPDES Permit No. TN0026450.
- 2) *Methods Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing (40 CFR Part 130)*. EPA 821-B-00-004 (July 2000).
- 3) *Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge System*. EPA 833-R-00-003 (June 2000)
- 4) Lewis, P. A., D. J. Klemm, J. M. Lazorchak, T. J. Norberg-King, W. H. Peltier, M. A. Heber. *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, EPA/600/4-91/002 (July 1994).
- 5) S&ME Standard Operating Procedures. April, 2000.

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix B

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

And

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

Table B-1. Analysis of Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Total Residual Chlorine*, December 10 – December 14, 2001

2001		Sample Type	Total Residual Chlorine
Month	Date		
			(mg/L)
December	10	Comp	0.08
December	12	Comp	0.05
December	14	Comp	0.08

*Towerbrom-960 (Oxidizing Biocide) 7% Sodium Bromide, 89% Sodium Dichloroisocyanurate is utilized in the essential raw cooling water and in the raw cooling water systems at SQN to control the growth of microbiologically induced bacteria and Asiatic Clams. The treatment is necessary for adequate cooling water flow, efficient heat exchange and corrosion prevention. The injected chemical is diluted by the condenser cooling water flow as well as from the flow from other sources.

Table B-2. Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-December 14, 2001

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-2 (continued). Sequoyah Nuclear Plant Diffuser (Outfall 101) Discharge Concentrations of Chemicals Used to Control Growth of Microbiologically Induced Bacteria and Asiatic Clams, During Toxicity Test Sampling, March 12, 1998-December 14, 2001

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

Table B-3. Water Chemistry Mean Values and Ranges for Daphnid Test, Sequoyah Nuclear Plant (SQN), December 10 - 17, 2001

Test/ Sample ID	Temperature		Dissolved Oxygen		pH		Conductance	Alkalinity	Hardness	Total Residual
	Initial	Final	Initial	Final	Initial	Final	Initial	Initial	Initial	Chlorine
	(°C)	(°C)	(mg/L)	(mg/L)	S.U.	S.U.	(µmhos)	mg/L CaCO ₃	mg/L CaCO ₃	(mg/L)
Daphnid/ Control	24.7 (24.0-25.2)	24.9 (24.3-25.5)	7.3 (7.1-7.6)	7.0 (6.3-7.8)	8.0 (7.9-8.2)	8.0 (7.9-8.1)	164 (134-181)	63.0 (60-67)	91.7 (90-95)	-
Daphnid/ 10.98	24.7 (24.0-25.4)	25.0 (24.4-25.4)	7.4 (7.1-7.8)	7.0 (6.3-7.7)	8.1 (8.0-8.1)	8.1 (8.0-8.2)	170 (152-183)	-	-	-
Daphnid/ 22.0 %	24.7 (24.0-25.2)	24.9 (24.4-25.4)	7.3 (7.1-7.6)	7.1 (6.6-7.8)	8.1 (8.0-8.1)	8.1 (8.0-8.1)	173 (159-185)	-	-	-
Daphnid/ 44.0 %	24.7 (24.0-25.3)	24.7 (24.0-25.3)	7.3 (7.1-7.5)	7.1 (6.7-7.7)	8.0 (7.9-8.0)	8.1 (8.1-8.2)	179 (168-188)	-	-	-
Daphnid/ 72.0 %	24.7 (24.0-25.3)	24.5 (24.0-25.1)	7.2 (7.0-7.5)	7.2 (6.9-7.7)	7.9 (7.8-7.9)	8.2 (8.1-8.3)	186 (178-194)	-	-	-
Daphnid/ 100.0 %	24.8 (24.0-25.4)	24.5 (24.0-25.0)	7.3 (7.0-7.8)	7.2 (6.9-7.8)	7.8 (7.6-7.9)	8.2 (8.1-8.3)	194 (183-205)	66.3 (63-69)	76.7 (70-80)	0.07 (0.05-0.08)
Daphnid/ Intake	24.8 (24.0-25.3)	24.6 (24.1-25.2)	7.3 (7.0-8.0)	7.2 (6.7-7.8)	7.7 (7.4-7.8)	8.0 (7.3-8.2)	195 (190-205)	68.3 (67-70)	76.0 (72-80)	0.09 (0.05-0.15)

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix C

Chain of Custody Records and
Toxicity Bench Sheets

BIOMONITORING CHAIN OF CUSTODY-RECORD

Page 1 of 1

Client: IVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.

1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003

Fax: 865-970-0004

FedEx UPS Bus Client

Other (specify): _____

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time, (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
QN-DIS-101-TOX	comp	4°C	12/9/01 0922	12/10/01 0822	(1) 2.5 GAL		✓				01435	0.3°C	ISO	1235	6/12/01
QN-INT-TOX	comp	4°C	12/9/01 0940	12/10/01 0840	(1) 2.5 GAL		✓				01436	0.5°C	ISO	1235	6/12/01

Relinquished By (Signature):

Sample Custody - Fill In From Top Down

Date/Time

Received By (Signature):

Date/Time

<u>Wanda Allen</u>	12/10/01 0930	<u>R. Thumley</u>	12/10/01 0930
<u>L. Humley</u>	12/10/01 1232	<u>Gene J. Douthett</u>	12/10/01 1232

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The holding 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 analyze 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.

OC

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: IVA
 Project Name: SEQUOYAH NUCLEAR PLANT
 P.O. Number: PO BOX 2000
 Facility Sampled: SEQUOYAH NUCLEAR PLANT
 NPDES Number: TN0026450
 Collected By: WANDA ALLEN

S & ME, Inc.
 1413 Topside Road, Louisville, TN 37777
 Phone: 865-970-0003
 Fax: 865-970-0004

FedEx UPS Bus Client
 Other (specify): _____

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
QN-DIS-101-TOX	comp	4°C	12/11/01 0909	12/12/01 0809	(1) 2.5 GAL				✓		01-433	0.9	ISD	12/15	CLD
QN-INT-TOX	comp	4°C	12/11/01 0926	12/12/01 0826	(1) 2.5 GAL				✓		01-434	1.4	ISD	12/15	CLD

Relinquished By (Signature):		Sample Custody - Fill In From Top Down		Received By (Signature):		Date/Time	
<u>Wanda Allen</u>		Date/Time		<u>R. Mc...</u>		Date/Time	
<u>P. Mc...</u>		12/12/01 1000		<u>Steve S. D...</u>		12/12/01 1015	
		12/12/01 1210				12/12/01 1210	

Instructions: Clients should fill in all areas except those in the "Laboratory Use" block. Biomonitoring samples are preserved by storing them at 4°C and shipping them in ice. The holding 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 1 of 1Client: TVAProject Name: SEQUOYAH NUCLEAR PLANTP.O. Number: PO BOX 2000Facility Sampled: SEQUOYAH NUCLEAR PLANTNPDES Number: TN0026450Collected By: WANDA ALLEN

S & ME, Inc.

1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003

Fax: 865-970-0004

FedEx UPS Bus Client

Other (specify): _____

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
3QN-DIS-101-TOX	comp	4°C	12/13/01 0824	12/14/01 0724	(2) 2.5 GAL		✓				01-431	2°C	D8	1236	2507
3QN-INT-TOX	comp	4°C	12/13/01 0841	12/14/01 0741	(1) 2.5 GAL		✓				01-432	2°C	D8	1236	2507

Sample Custody - Fill In From Top Down

Relinquished By (Signature):

Date/Time

Received By (Signature):

Date/Time

<i>Wanda Allen</i>	12/14/01 1000	<i>R. N. N. N.</i>	12/14/01 1002
<i>R. N. N. N.</i>	12/14/01 1235	<i>V. N. N.</i>	12/14/01 1235

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

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: TVA - Sequoyah Nuclear Plant

Test Conducted From: 12/10/01 (Day 0) To 12/17/01 (Day 7)

Sites/Concentrations: 1. Control 4. 43.9% 7. Intake
2. 10.98% 5. 72%
3. 22% 6. 100% outflow

Stock (if applicable): _____

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☒

Other (describe): _____ ☐

Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☒

Other (describe): _____ ☐

Source of Test Organisms: S&ME brood board nos. 169

Age of Test Organisms:

Isolated neonates for test on 12/10/01 (date) from 0830 to 1400 (time) Initials USD

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: Jane S. D. H. K. (Reviewer Initials) on 12/17/01 (Date)

REV.01, January 00 (ceriodaphnia test info sheet)

Ceriodaphnia Daily Test Information Logsheet

Test Name: TVA - Sequoyah Nuclear Plant Test Dates: 12/10/01 - 12/17/01

Daily Test information	Temperature Information (cup -25±1°C)		Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments		
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selenastrum Date	Start Time	End Time	Carboy # Date Prep.	
	a.m.	p.m.									
Day 0 LSD 12/10/01	—	25.1	4	1500	7/17/01	1500	11/20/01	1430	1500	1	12/9/01
Day 1 BAO 12/11/01	25.2	25.2	4	✓ 1530	7/17/01	✓ 1530	11/20/01	1500	1505	1	12/10/01
Day 2 VCS 12/12/01	25.1	25.3	4	1515	7/17/01	1515	11/20/01	1445	1515	1	12/10/01
Day 3 VCS 12/13/01	25.1	25.1	4	1445	7/17/01	1445	11/20/01	1415	1445	1	12/10/01
Day 4 VCS 12/14/01	25.1	25.2	4	1400	7/17/01	1400	11/20/01	1330	1400	1	12/13/01
Day 5 BAO 12/15/01	25.3	25.2	4	1400	7/17/01	1400	11/20/01	1330	1400	1	12/13/01
Day 6 AUP 12/16/01	25.2	25.2	4	1415	7/17/01	1415	11/20/01	1345	1414	1	12/13/01
Day 7 VCS 12/17/01	25.2	25.2	4					1500		—	—

Ceriodaphnia 3-Brood Survival and Reproduction Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah

Analysts: BAO, VCS, ALR

Location: Soddy Daisy, Tennessee

Test Start-Date/Time: 12/10/01/1430

Dates Samples Collected: 12/10, 12/12, 12/14

Test Stop-Date/Time: 12/17/01/1500

Replicate												Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult		
Conc.			1	2	3	4	5	6	7	8	9					10	
	Init.	Day	--	--	--	--	--	--	--	--	--	--					
Control DMW 20%	BAO	1	0										2	0	10	10	0
	VCS	2	0										2	0	10	10	0
	VCS	3	0										2	0	10	10	0
	VCS	4	5	5	4	6	1	4	5	0	7	4	41	10	10	4.1	
	BAO	5	0	0	4	0	0	0	0	5	0	0	9	10	10	0.9	
	ALR	6	10	10	0	8	7	7	8	8	7	10	77	10	10	7.7	
	VCS	7	13	16	14	12	16	15	11	11	12	10	130	10	10	13.0	
Total			28	31	22	26	24	26	24	24	28	24	257	10	10	25.7	

Conc.		Replicate											Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
		Init.	Day	1	2	3	4	5	6	7	8	9				
10.98% Outfall	BAO	1	0										0	10	10	0
	VCS	2	0										0	10	10	0
	VCS	3	0										0	10	10	0
	VCS	4	5	4	1	5	3	4	4	6	4	5	41	10	10	4.1
	BAO	5	7	7	5	6	0	0	0	0	0	0	48.25	10	10	2.5
	AWL	6	0	0	0	0	3	7	8	8	7	5	44	10	10	4.4
	VCS	7	14	14	14	11	14	13	16	8	13	14	131	10	10	13.1
Total		26	25	24	22	20	24	28	22	24	24	24	241	10	10	24.1

Replicate													Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9	10				
22.0% Outfall			--	--	--	--	--	--	--	--	--	--				
	BAO	1	0										0	10	10	0
	VCS	2	0										0	10	10	0
	VCS	3	0										0	10	10	0
	VCS	4	7	5	5	7	1	5	4	4	6	4	48	10	10	4.8
	BAO	5	8	0	7	0	4	0	0	0	0	0	19	10	10	1.9
	ALR	6	0	7	0	3	7	6	7	7	7	6	50	10	10	5.0
	VCS	7	15	12	18	13	16	17	17	12	16	15	151	10	10	15.1
			Total	30	24	30	23	28	28	26	23	29	25	268	10	10

Ceriodaphnia 3-Brood Survival and Reproduction

Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah

Analyst: Ben VCS

Location: Soddy Daisy, Tennessee

Test Start-Date/Time: 12/10/01/1430

Dates Samples Collected: 12/10 12/12 12/14

Test Stop-Date/Time: 12/17/01/1500

Replicate												Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult	
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9					10
43.9% Outfall			-	-	-	-	-	-	-	-	-	-				
	Bro	1	0										0	10	10	0
	VCS	2	0										0	10	10	0
	VCS	3	0										0	10	10	0
	VCS	4	6	5	3	4	3	4	3	6	4	5	43	10	10	4.3
	Bro	5	0	0	7	8	0	0	0	0	0	0	15	10	10	1.5
	ALL	6	10	8	0	0	11	5	4	8	8	8	67	10	10	6.7
	VCS	7	15	16	15	12	15	16	16	10	12	11	138	10	10	13.8
		Total	31	29	25	24	29	28	25	24	24	24	263	10	10	26.3

Replicate												Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult		
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9					10	
72% Outfall			--	--	--	--	--	--	--	--	--	--					
	Bro	1	0											0	10	10	0
	VCS	2	0											0	10	10	0
	VCS	3	0											0	10	10	0
	VCS	4	5	5	5	5	3	0	3	4	5	4	39	10	10	3.9	
	Bro	5	0	0	0	7	8	0	1	0	0	0	16	10	10	1.6	
	ALL	6	8	10	9	0	0	10	5	9	7	7	68	10	10	6.8	
	VCS	7	11	12	15	15	11	13	12	10	11	12	122	10	10	12.2	
		Total	24	27	29	27	22	23	24	23	23	23	245	10	10	24.5	

Replicate												Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult	
Conc.			1	2	3	4	5	6	7	8	9					10
100% Outfall	Init.	Day	--	--	--	--	--	--	--	--	--	--				
	BAO	1	0										0	10	10	0
	VCS	2	0										0	10	10	0
	VCS	3	0										0	10	10	0
	VCS	4	5	4	5	4	4	5	4	4	4	3	42	10	10	4.2
	BAO	5	0	0	7	9	7	0	0	0	0	0	23	10	10	2.3
	ALL	6	7	8	0	0	0	0	7	6	8	7	53	10	10	5.3
	VCS	7	15	15	18	10	17	11	14	9	14	12	135	10	10	13.5
	Total	27	27	20	23	20	24	25	21	26	21	253	10	10	25.3	

30
VCS

Ceriodaphnia 3-Brood Survival and Reproduction **Raw Data Sheet**

Client: Tennessee Valley Authority-Sequoyah

Analysts: BAD, v/s, P12

Location: Soddy Daisy, Tennessee

Test Start-Date/Time: 12/10/01 1430

Dates Samples Collected: 12/10, 12/12, 12/14

Test Stop-Date/Time: 12/17/01 1500

Conc.	Init.	Day	Replicate										Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
			1	2	3	4	5	6	7	8	9	10				
100% Intake			-	-	-	-	-	-	-	-	-	-				
	BAD	1	0										0	10	10	0
	YCS	2	0										0	10	10	0
	YCS	3	0										0	10	10	0
	YES	4	4	6	3	5	3	3	6	4	4	5	43	10	10	4.3
	BAD	5	8	9	7	0	0	0	0	0	0	0	24	10	10	2.4
	MUL	6	5	1	0	9	8	9	9	7	9	9	60	10	10	6.0
	YCS	7	16	16	13	11	15	16	12	11	11	12	133	10	10	13.3
		Total	30	32	23	25	26	27	26	22	24	25	260	10	10	26.0

Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/01 14:30 Test ID: SN1201cr Sample ID: TN0026450
 End Date: 12/17/01 15:00 Lab ID: S&ME INC. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	31.000	22.000	26.000	24.000	26.000	24.000	24.000	28.000	24.000
10.98	26.000	25.000	26.000	22.000	20.000	24.000	28.000	22.000	24.000	24.000
22	30.000	24.000	30.000	23.000	28.000	28.000	28.000	23.000	29.000	25.000
43.9	31.000	29.000	25.000	24.000	29.000	28.000	25.000	24.000	24.000	24.000
72	24.000	27.000	29.000	27.000	22.000	23.000	24.000	23.000	23.000	23.000
100	27.000	27.000	30.000	23.000	28.000	24.000	25.000	21.000	26.000	22.000

Conc-%	Mean	N-Mean	Transform: Untransformed					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
D-Control	25.700	1.0000	25.700	22.000	31.000	10.384	10			25.725	1.0000
10.98	24.100	0.9377	24.100	20.000	28.000	9.672	10	90.00	75.00	25.725	1.0000
22	26.800	1.0428	26.800	23.000	30.000	10.376	10	116.00	75.00	25.725	1.0000
43.9	26.300	1.0233	26.300	24.000	31.000	10.147	10	112.50	75.00	25.725	1.0000
72	24.500	0.9533	24.500	22.000	29.000	9.475	10	88.50	75.00	24.900	0.9679
100	25.300	0.9844	25.300	21.000	30.000	11.187	10	101.50	75.00	24.900	0.9679

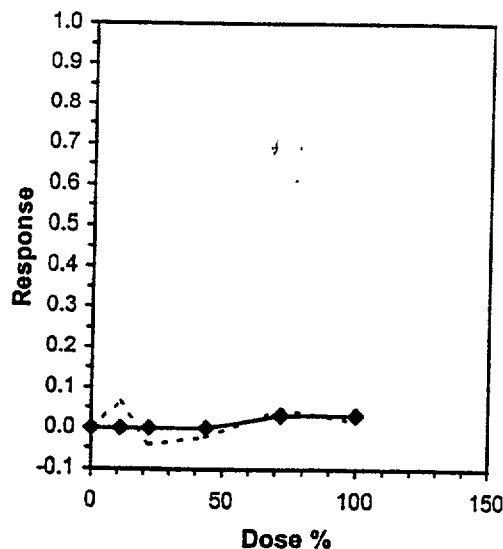
Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution ($p \leq 0.01$)	1.16764	1.035	0.25398	-0.8876
Bartlett's Test indicates equal variances ($p = 0.99$)	0.63383	15.0863		

Hypothesis Test (1-tail, 0.05)

	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

Point	%	SD	Linear Interpolation (80 Resamples)	
			95% CL	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/01 14:30 Test ID: SN1201Incr Sample ID: TN0026450
 End Date: 12/17/01 15:00 Lab ID: S&ME INC. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	28.000	31.000	22.000	26.000	24.000	26.000	24.000	24.000	28.000	24.000
Intake	30.000	32.000	23.000	25.000	26.000	27.000	26.000	22.000	24.000	25.000

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	25.700	1.0000	25.700	22.000	31.000	10.384	10			
Intake	26.000	1.0117	26.000	22.000	32.000	11.750	10	-0.234	1.734	2.224

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.93247	0.868	0.76037	-0.0034
F-Test indicates equal variances ($p = 0.69$)	1.31045	6.54109		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates no significant differences

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant

Analyst: LSD, VCS, BAO, BAO

Location: Soddy Daisy, Tennessee

Dates/times: 12/10/01 12:35, 12/17/01 1:50

Template No.: 1

Age of neonates: 224 hrs

Day									
Control: (20% DMW)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.3	24.4	25.2	25.1	24.0	25.0		
Final		24.3	24.9	25.5	25.4	24.4	25.3	24.8	
D.O. Initial	7.1	7.5	7.6	7.2	7.2	7.6	7.2		
Final		7.0	7.8	7.0	6.3	6.8	6.9	7.5	
pH Initial	8.1	8.1	7.9	7.9	8.0	8.2	8.1		
Final		8.0	8.1	8.0	7.9	8.0	8.0	8.1	
Alkalinity	67	62			62				alk day 0 - 67
Hardness	90	90			95				alk day 4 = 60
Conductivity-Initial	181	179	173	170	134	150	154		
Analyst Initials	LSD	BAO	BAO	DSS	VCS	BAO	DSS	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
10.98% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.7	24.3	24.4	25.4	25.2	24.0	25.0		
Final		24.4	24.8	25.4	25.4	25.2	25.0	24.6	d.O. 6 days = 7.2
D.O. Initial	7.1	7.5	7.5	7.2	7.2	7.9	7.8		
Final		7.0	7.7	6.8	6.3	6.6	6.8	7.7	
pH Initial	8.1	8.0	8.0	8.1	8.1	8.1	8.1		
Final		8.1	8.2	8.1	8.0	8.0	8.0	8.1	
Conductivity-Initial	183	180	179	176	152	156	161		
Analyst Initials	LSD	BAO	BAO	DSS	DSS	BAO	DSS	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
22% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.5	24.5	25.2	25.1	24.0	25.1		
Final		24.4	24.7	25.4	24.7	25.2	25.0	24.6	
D.O. Initial	7.1	7.4	7.5	7.2	7.2	7.6	7.2		
Final		7.0	7.7	6.3	6.6	6.7	6.8	7.8	
pH Initial	8.0	8.0	8.0	8.1	8.1	8.1	8.1		
Final		8.1	8.2	8.1	8.0	8.1	8.0	8.1	
Conductivity-Initial	185	183	182	182	160	159	160		
Analyst Initials	LSD	BAO	BAO	DSS	DSS	BAO	DSS	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Notes:

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant

Analysts: VCS, LSD, BND, DSG

Location: Soddy Daisy, Tennessee

Dates/times: 12/10/01/1430 - 12/17/01/1500

Template No.:

Age of neonates: 234 hrs

Day									
43.9% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.4	24.4	25.3	25.0	24.0	25.0		
Final		24.0	24.6	25.3	24.3	24.7	24.2	24.5	
D.O. Initial	7.1	7.2	7.5	7.2	7.2	7.5	7.2		
Final		7.1	7.7	6.8	6.7	6.9	6.9	7.6	
pH Initial	8.0	7.9	7.9	8.0	8.0	8.0	8.0		
Final		8.1	8.2	8.1	8.1	8.1	8.1	8.1	
Conductivity-Initial	187	186	187	188	168	158	164		cond day 5 = 168
Analyst Initials	LSD	BND	BND	DSG	DSG	BND	DSG		
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
72% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.6	24.6	25.3	25.1	24.0	25.0		
Final		24.0	24.5	25.1	24.0	24.6	25.0	24.6	
D.O. Initial	7.1	7.0	7.5	7.2	7.2	7.5	7.2		
Final		7.1	7.7	6.9	7.0	6.9	6.9	7.6	
pH Initial	7.8	7.8	7.8	7.9	7.9	7.9	7.9		
Final		8.1	8.3	8.1	8.1	8.2	8.2	8.2	
Conductivity-Initial	190	189	193	194	179	178	181		
Analyst Initials	LSD	BND	BND	DSG	DSG	BND	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
100% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.8	24.9	25.4	25.1	24.0	25.0		24.8 = init. temp day 2
Final		24.1	24.4	25.0	24.0	24.5	25.0	24.4	
D.O. Initial	7.0	7.2	7.2	7.2	7.2	7.5	7.2		init D.O. day 2 = 7.8
Final		7.0	7.8	6.9	7.1	7.0	7.1	7.6	
pH Initial	7.7	7.6	7.8	7.9	8.0	7.8	7.8		pH day 4 = 7.8
Final		8.1	8.3	8.2	8.1	8.2	8.2	8.2	
Alkalinity	63		69		67				conducting day 4 = 191
Hardness	70		80		80				
Conductivity-Initial	193	194	201	205	188	191	183		
Chlorine	0.07		0.08		0.07				
Analyst Initials	LSD	BND	BND	DSG	VCS	BND	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10	12/10	12/12	12/12	12/14	12/14	12/14		

Notes:

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant

Analysts: VCS, LSD, BMD, DSG

Location: Soddy Daisy, Tennessee

Dates/times: 12/10/01/1430-12/11/01/1500

Template No.: 1

Age of neonates: <24 hrs

	Day								
Intake-100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	25.0	24.8	25.3	25.3	24.0	25.0		
Final		24.2	24.1	24.9	24.9	24.3	25.2	24.6	
D.O. Initial	7.0	7.1	8.0	7.2	7.2	7.6	7.2		
Final		7.0	7.8	7.0	6.7	7.0	7.0	7.7	
pH Initial	7.4	7.12	7.7	7.8	7.8	7.8	7.8		
Final		8.1	8.0	8.1	8.2	8.2	7.3	8.2	
Alkalinity	1.7	/	70	/	68	/	/		
Hardness	72	/	80	/	76	/	/		
Conductivity-Initial	190	198	196	205	193	192	194		
Chlorine	0.15	/	0.06	/	0.05	/	/		
Analyst Initials	LSD	BMD	BMD	VCS	VCS	BMD	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10/01	12/10	12/12	12/12	12/14	12/14	12/14	/	

Notes:

Cerio Water Chemistry

SQN- December 10 - 17, 2001 INITIAL AND FINAL WATER CHEMISTRY (CERIO)

Initial Chemistry

CERIO

Control	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.6	24.3	24.4	25.2	25.1	24.0	25.0	24.0	25.2	24.7
DO	7.1	7.5	7.6	7.2	7.2	7.6	7.2	7.1	7.6	7.3
pH	8.1	8.1	7.9	7.9	8.0	8.2	8.1	7.9	8.2	8.0
Cond	181	179	173	170	134	150	159	134	181	164
Hard	90.0	90.0			95.0			90.0	95.0	91.7
Alk	67.0	62.0			60.0			60.0	67.0	63.0

Concentration 10.98%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.7	24.3	24.4	25.4	25.2	24.0	25.0	24.0	25.4	24.7
DO	7.1	7.5	7.5	7.2	7.2	7.8	7.2	7.1	7.8	7.4
pH	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.0	8.1	8.1
Cond	183	180	179	176	152	156	161	152	183	170

Concentration 22%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.6	24.5	24.5	25.2	25.1	24.0	25.1	24.0	25.2	24.7
DO	7.1	7.4	7.5	7.2	7.2	7.6	7.2	7.1	7.6	7.3
pH	8.0	8.0	8.0	8.1	8.1	8.1	8.1	8.0	8.1	8.1
Cond	185	183	182	182	160	159	160	159	185	173

Concentration 43.9%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.5	24.4	24.4	25.3	25.0	24.0	25.0	24.0	25.3	24.7
DO	7.1	7.2	7.5	7.2	7.2	7.5	7.2	7.1	7.5	7.3
pH	8.0	7.9	7.9	8.0	8.0	8.0	8.0	7.9	8.0	8.0
Cond	187	186	187	188	168	168	169	168	188	179

Concentration 72%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.6	24.6	24.6	25.3	25.1	24.0	25.0	24.0	25.3	24.7
DO	7.1	7.0	7.5	7.2	7.2	7.5	7.2	7.0	7.5	7.2
pH	7.8	7.8	7.8	7.9	7.9	7.9	7.9	7.8	7.9	7.9
Cond	190	189	193	194	179	178	181	178	194	186

Concentration 100%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.6	24.8	24.9	25.4	25.1	24.0	25.0	24.0	25.4	24.8
DO	7.0	7.2	7.8	7.2	7.2	7.5	7.2	7.0	7.8	7.3
pH	7.7	7.6	7.8	7.9	7.8	7.8	7.8	7.6	7.9	7.8
Cond	193	194	201	205	191	191	183	183	205	194
Hard	70.0		80.0		80.0			70	80	76.7
Alk	63.0		69.0		67.0			63	69	66.3
TRC	0.07		0.08		0.07			0.07	0.08	0.07

Cerio Water Chemistry

Intake	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	25.0	24.8	25.3	25.3	24.0	25.0	24.0	25.3	24.8
DO	7.0	7.1	8.0	7.2	7.2	7.6	7.2	7.0	8.0	7.3
pH	7.4	7.6	7.7	7.8	7.8	7.8	7.8	7.4	7.8	7.7
Cond	190	198	196	205	193	192	194	190	205	195
Hard	72.0		80.0		76.0			72	80	76.0
Alk	67.0		70.0		68.0			67	70	68.3
TRC	0.15		0.06		0.05			0.05	0.15	0.09

Final Chemistry

CERIO

Cerio - Medium	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.3	24.9	25.5	25.4	24.4	25.3	24.8	24.3	25.5	24.9
DO	7.0	7.8	7.0	6.3	6.8	6.9	7.5	6.3	7.8	7.0
pH	8.0	8.1	8.0	7.9	8.0	8.0	8.1	7.9	8.1	8.0

Concentration 10.98%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.4	24.8	25.4	25.4	25.2	25.0	24.6	24.4	25.4	25.0
DO	7.0	7.7	6.8	6.3	6.6	6.8	7.7	6.3	7.7	7.0
pH	8.1	8.2	8.1	8.0	8.0	8.0	8.1	8.0	8.2	8.1

Concentration 22%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.4	24.7	25.4	24.7	25.2	25.0	24.6	24.4	25.4	24.9
DO	7.0	7.7	6.8	6.6	6.7	6.8	7.8	6.6	7.8	7.1
pH	8.1	8.2	8.1	8.0	8.1	8.0	8.1	8.0	8.2	8.1

Concentration 43.9%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.0	24.6	25.3	24.3	24.7	25.2	24.5	24.0	25.3	24.7
DO	7.1	7.7	6.8	6.7	6.9	6.9	7.6	6.7	7.7	7.1
pH	8.1	8.2	8.1	8.1	8.1	8.1	8.1	8.1	8.2	8.1

Concentration 72%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.0	24.5	25.1	24.0	24.6	25.0	24.6	24.0	25.1	24.5
DO	7.1	7.7	6.9	7.0	6.9	6.9	7.6	6.9	7.7	7.2
pH	8.1	8.3	8.1	8.1	8.2	8.2	8.2	8.1	8.3	8.2

Concentration 100%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.1	24.4	25.0	24.0	24.5	25.0	24.4	24.0	25.0	24.5
DO	7.0	7.8	6.9	7.1	7.0	7.1	7.6	6.9	7.8	7.2
pH	8.1	8.3	8.2	8.1	8.2	8.2	8.2	8.1	8.3	8.2

Cerio Water Chemistry

Intake	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.2	24.1	24.9	24.9	24.3	25.2	24.6	24.1	25.2	24.6
DO	7.0	7.8	7.0	6.7	7.0	7.0	7.7	6.7	7.8	7.2
pH	8.1	8.0	8.1	8.2	8.2	7.3	8.2	7.3	8.2	8.0

Test temperature Mean: 24.7
 Min: 24.0
 Max: 25.5

Word Review by: Cnr

Excel Reviewed by: Cnr

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix D

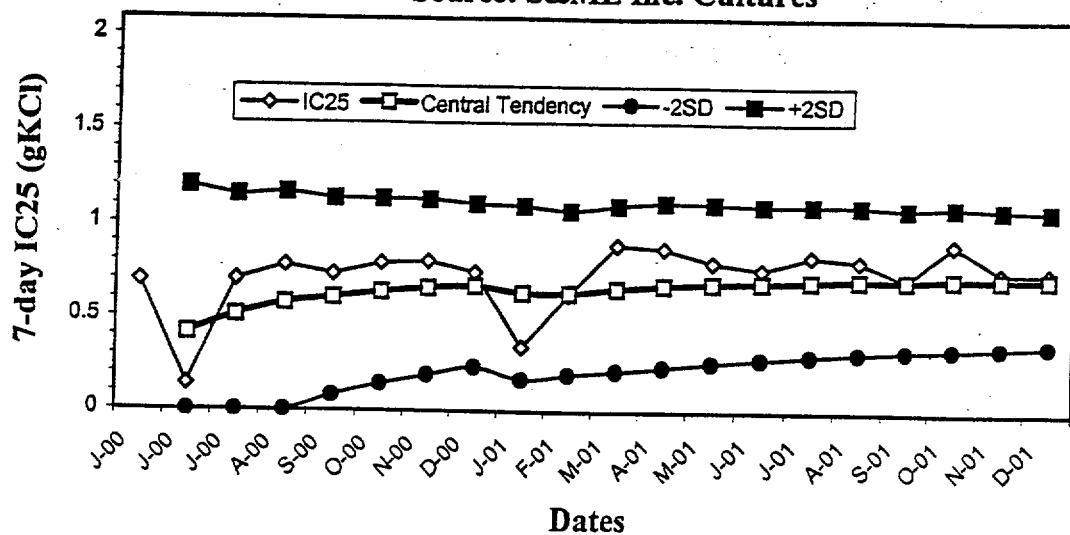
Reference Toxicant Tests and
Control Chart Information

Fathead Minnow Potassium Chloride Chronic Reference Toxicant

Control Chart

CV% = 25.0

Source: S&ME Inc. Cultures



Dates	Values	Mean	-2 SD	+2 SD
6/13/00	0.6935			
7/10/00	0.1400	0.4168	0.0000	1.1996
7/26/00	0.7000	0.5112	0.0000	1.1541
8/24/00	0.7760	0.5774	0.0000	1.1653
9/17/00	0.7317	0.6082	0.0807	1.1358
10/17/00	0.7892	0.6384	0.1439	1.1329
11/30/00	0.7997	0.6615	0.1939	1.1290
12/30/00	0.7418	0.6715	0.2349	1.1081
1/29/01	0.3442	0.6351	0.1721	1.0981
2/19/01	0.6250	0.6341	0.1975	1.0707
3/6/01	0.8859	0.6570	0.2159	1.0981
4/9/01	0.8693	0.6747	0.2366	1.1128
5/10/01	0.7948	0.6839	0.2592	1.1086
6/4/01	0.7580	0.6892	0.2793	1.0992
7/18/01	0.8288	0.6985	0.2970	1.1001
8/20/01	0.8040	0.7051	0.3136	1.0966
9/18/01	0.7039	0.7050	0.3260	1.0841
10/30/01	0.8997	0.7159	0.3368	1.0949
11/18/01	0.7502	0.7177	0.3490	1.0864
12/9/01	0.7514	0.7194	0.3602	1.0785

Fathead Minnow Daily Test Information Logsheet

Test Name: Chronic Reference Test

Test Dates: 12/9/01 - 12/16/01

Daily Test information		Temperature Information (25±1°C)		Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time	Carboy #	Date Prep.
	a.m.	p.m.							
Day 0 LSO 12/9/01	25.3	25.3	4		am: — pm: 1600	1135	1230	2	12/7/01
Day 1 XS 12/10/01	25.2	25.1	4		am: 1000 pm: 1615	1145	1215	2	12/9/01
Day 2 B+O 12/11/01	25.2	25.2	4		am: 0930 pm: 1600	1115	1145	4	12/9/01
Day 3 XS 12/12/01	25.1	25.3	4		am: 1000 pm: 1630	1100	1130	4	12/11/01
Day 4 XS 12/13/01	25.1	25.1	4		am: 0930 pm: 1600	1040	1115	2	12/11/01
Day 5 XS 12/14/01	25.1	25.2	4		am: 0830 pm: 1600	1040	1105	4	12/12/01
Day 6 BO 12/15/01	25.3	25.2	4		am: 0915 pm: 1500	1035	1105	2	12/13/01
Day 7 AL2 12/16/01	25.2	25.2	4			1100		—	—

Client: S&ME Chronic Reference

Analyst: DSG, LSD, VCS

Location: S&ME Laboratory

Dates: 12/19/01 - 12/16/01

CUMULATIVE MORTALITY OF *P. PROMELAS* IN CHRONIC TEST

CONC.	Initials	REPLICATE				
		DAY NO.	A	B	C	D
Control Mod. Hard	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	0	0	0
	LSD	4	0	0	0	0
	LSD	5	0	0	0**	0
	LSD	6	0	0	0	0
	ALR	7	0	0	0	0
250 mg/L (KCl)	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	0	0	0
	LSD	4	0	0	0	0
	LSD	5	0	0	0	0
	LSD	6	0	0	0	0
	ALR	7	0	0	0	0
500 mg/L (KCl)	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	0	0	0
	LSD	4	0	0	0	0
	LSD	5	0	0	0	0
	LSD	6	0	0	0	0
	ALR	7	0	0	0	0
750 mg/L (KCl)	VCS	1	0	0	0	0
	VCS	2	0	0	0	0
	VCS	3	0	2	0	1
	LSD	4	0	2	1	1
	LSD	5	1	3	3	1
	LSD	6	1	3	3	1
	ALR	7	1	3	4	1
1000 mg/L (KCl)	VCS	1	0	0	1	1
	VCS	2	3	0	3	3
	VCS	3	6	6	6	6
	LSD	4	6	6	6	6
	LSD	5	6	6	6	6
	LSD	6	3	2	7	6
	ALR	7	7	8	8	6

CONC.	Initials	REPLICATE				
		DAY NO.	A	B	C	D
1500 mg/L (KCl)	VCS	1	7	6	5	5
	VCS	2	9	8	7	9
	VCS	3	10	9	8	9
	LSD	4	10	10	10	10
		5	↓	↓	↓	↓
		6				
		7	↓	↓	↓	↓
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

* Last 4 fish when cup was spilled 12/14/01 LSD

** Injured during renewal 12/14/01 LSD

FATHEAD MINNOW SEVEN DAY TEST

RAW DATA

SURVIVAL AND GROWTH

Client: S&ME Chronic Reference Test

Test Conducted By: DSC, LSO, VCS

Date Weighed 12/17/01

Weights Conducted by: DSC

Test Dates: 12/9/01 - 12/16/01 Oven Temp 103
 Comments: _____
 Drying Time (h) 400 LSO 9 1/2 hrs
 End of drying (date/time) 0900 12/17/01
 Start of drying (date/time) 1130 12/16/01

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare)(mg)	Mean Dry Weight (mg)
Control	A	10	10	1264.99	1270.02	5.83	0.503
(Mod. Hard)	B	10	10	1253.35	1257.88	4.53	0.453
	C	10	10	1259.65	1264.55	4.90	0.490
	D	10	10	1255.13	1260.40	5.27	0.527
250 mg/L	A	10	10	1264.50	1269.51	5.01	0.501
(KCI)	B	10	10	1263.07	1268.88	5.01	0.501
	C	10	10	1263.71	1267.97	4.26	0.426
	D	10	10	1264.20	1269.19	4.99	0.499
500 mg/L	A	10	10	1257.10	1259.55	2.45	0.408
(KCI)	B	10	10	1260.41	1264.73	4.32	0.432
	C	10	10	1263.02	1267.94	4.92	0.492
	D	10	10	1262.73	1267.34	4.61	0.461
750 mg/L	A	9	10	1258.84	1262.39	3.55	0.355
(KCI)	B	7	10	1262.35	1266.46	4.11	0.411
	C	6	10	1250.18	1253.27	3.09	0.309
	D	9	10	1250.41	1254.50	4.09	0.409
1000 mg/L	A	3	10	1263.15	1264.86	1.71	0.171
(KCI)	B	2	10	1262.94	1264.28	1.34	0.134
	C	2	10	1259.08	1260.38	1.30	0.130
	D	4	10	1250.47	1253.35	2.88	0.288

Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 12/9/01 11:35 Test ID: Ref1201fg Sample ID: REF-Ref Toxicant
 End Date: 12/16/01 11:00 Lab ID: Sample Type: KCL-Potassium chloride
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-mg/L	1	2	3	4
D-Control	0.5030	0.4530	0.4900	0.5270
250	0.5010	0.5010	0.4260	0.4990
500	0.4083	0.4320	0.4920	0.4610
750	0.3550	0.4110	0.3090	0.4090
1000	0.1710	0.1340	0.1300	0.2880

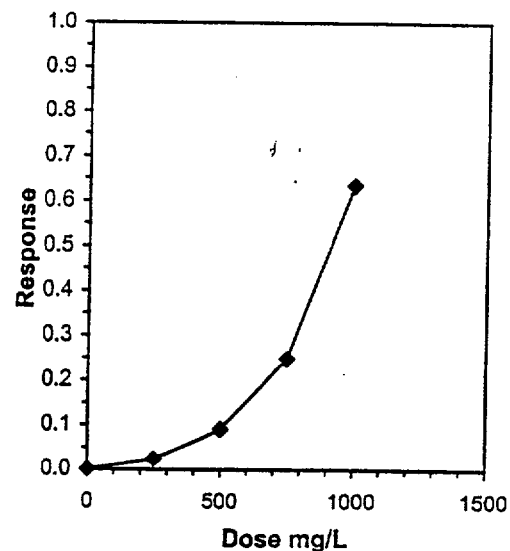
Conc-mg/L	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
D-Control	0.4933	1.0000	0.4933	0.4530	0.5270	6.265	4				0.4933	1.0000
250	0.4818	0.9767	0.4818	0.4260	0.5010	7.717	4	0.339	2.360	0.0800	0.4818	0.9767
500	0.4483	0.9089	0.4483	0.4083	0.4920	8.077	4	1.326	2.360	0.0800	0.4483	0.9089
*750	0.3710	0.7522	0.3710	0.3090	0.4110	13.153	4	3.608	2.360	0.0800	0.3710	0.7522
*1000	0.1807	0.3664	0.1807	0.1300	0.2880	40.854	4	9.222	2.360	0.0800	0.1807	0.3664

Auxiliary Tests

					Statistic	Critical		Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.94546	0.868		0.54046	0.49254		
Bartlett's Test indicates equal variances (p = 0.60)					2.76513	13.2767					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		500	750	612.372		0.07997	0.16213	0.0665	0.0023	6.7E-07	4, 15

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL(Exp)		Skew
IC05	348.47	119.00	0.00	639.68	-0.2193
IC10	514.25	80.68	65.98	639.22	-1.5899
IC15	593.98	47.43	431.48	741.82	-0.1763
IC20	673.71	51.28	551.96	818.15	0.2887
IC25	751.40	39.48	600.04	821.49	-0.6644
IC40	848.62	26.11	770.29	920.45	-0.1432
IC50	913.44				



Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: S&ME Reference Test

Analysts: LSD, DSG, VCS

Location: S&ME Inc. Laboratory

Dates/times: 12/9/01/1155 - 12/16/01/1100

Template No.: 1

Age of larvae: <24 hrs

Day									
Control: (Mod. Hard)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.0	24.4	24.6	25.1	24.3	24.1		
Final		24.8	25.2	25.0	25.3	24.8	24.1	24.5	
D.O. Initial	7.3	7.2	7.1	7.7	7.3	7.3	7.3		
Final		6.3	6.5	7.0	6.9	6.8	7.2	7.1	
pH Initial	8.0	7.8	8.0	7.9	8.0	8.1	8.2		
Final		7.8	7.7	7.5	7.8	7.5	7.8	7.6	
Alkalinity	71	62	67	65	67	67	70		
Hardness	95	98	100	98	92	90	92		
Conductivity	334	326	325	318	321	335	340		
Analyst Initials	DSG	VCS	BAD	BAD	DSG	VCS	BAD	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
250 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.4	24.0	24.0	24.6	25.2	24.2	24.1		
Final		24.8	25.2	25.1	25.3	25.1	24.5	24.4	
D.O. Initial	7.3	7.2	7.1	7.6	7.2	7.2	7.2		
Final		6.3	6.7	7.0	6.9	6.7	7.1	7.1	
pH Initial	8.1	7.9	8.0	8.0	8.0	8.1	8.2		
Final		7.6	7.6	7.5	7.8	7.5	7.9	7.6	
Conductivity	673	754	758	693	718	729	776		
Analyst Initials	DSG	VCS	BAD	BAD	DSG	VCS	BAD	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
500 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.1	24.0	24.4	24.7	25.2	24.3	24.2		
Final		24.8	25.9	25.2	25.3	25.1	25.4	24.7	
D.O. Initial	7.2	7.2	7.1	7.6	7.3	7.2	7.3		
Final		6.3	6.6	7.0	6.9	6.7	6.8	6.9	
pH Initial	8.1	8.0	8.0	8.0	8.0	8.2	8.3		
Final		7.6	7.6	7.6	7.8	7.6	7.9	7.7	
Conductivity	1171	1104	1097	1087	1122	1128	1164		Cond 1, 2 = 1123
Analyst Initials	DSG	VCS	BAD	BAD	DSG	VCS	BAD	ALR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

NOTES:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: S&ME Reference Test

Analysts: LSD, DSG

Location: S&ME Inc. Laboratory

Dates/times: 12/9/01/1135 - 12/16/01/1100

Template No.: 1

Age of larvae: <24 hrs

Day									
750 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.3	24.0	24.4	24.8	25.3	24.2	24.2		
Final		25.3	25.0	25.5	25.2	25.9	24.9	25.0	
D.O. Initial	7.2	7.1	7.1	7.6	7.2	7.2	7.2		No Per day 5 = 7.1
Final		6.2	6.5	7.0	7.0	6.5	6.9	6.4	
pH Initial	8.1	8.1	8.1	8.0	8.1	8.1	8.3		
Final		7.6	7.6	7.4	7.8	7.6	7.9	7.7	
Conductivity	1574	1519	1564	1512	1544	1538	1571		
Analyst Initials	DSG	VCS	BAD	BAD	DSG	VCS	BAD	HLR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
1000 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.6	24.0	24.4	24.8	25.4	24.3	24.2		
Final		25.0	26.0	25.0	25.3	25.1	24.9	25.1	
D.O. Initial	7.2	7.1	7.1	7.6	7.2	7.2	7.2		
Final		6.3	7.0	7.1	6.9	6.7	7.1	6.9	
pH Initial	8.2	8.1	8.1	8.0	8.1	8.2	8.3		
Final		7.6	7.7	7.6	7.8	7.5	7.9	7.7	
Conductivity	1986	1957	1948	1888	1959	1934	1852		
Analyst Initials	DSG	VCS	BAD	BAD	DSG	VCS	BAD	HLR	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
1500 mg/L (KCl)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.6	24.0	24.4	24.8	25.3				
Final		24.9	26.0	24.6	✓	✓	✓	✓	
D.O. Initial	7.2	7.1	7.1	7.6	7.3	✓	✓	✓	
Final		6.4	7.6	7.3	✓	✓	✓	✓	
pH Initial	8.1	8.1	8.1	8.0	9.0	✓	✓	✓	
Final		7.6	7.8	7.5	✓	✓	✓	✓	
Conductivity	2810	2730	2450	2720	2721				
Analyst Initials	DSG	VCS	BAD	BAD	DSG				
QA Review Initials	LSD	LSD	LSD	LSD	LSD				
Stock Solution Date	12/9/01	12/9/01	12/9/01	12/11	12/11	12/11/01	12/12/01		

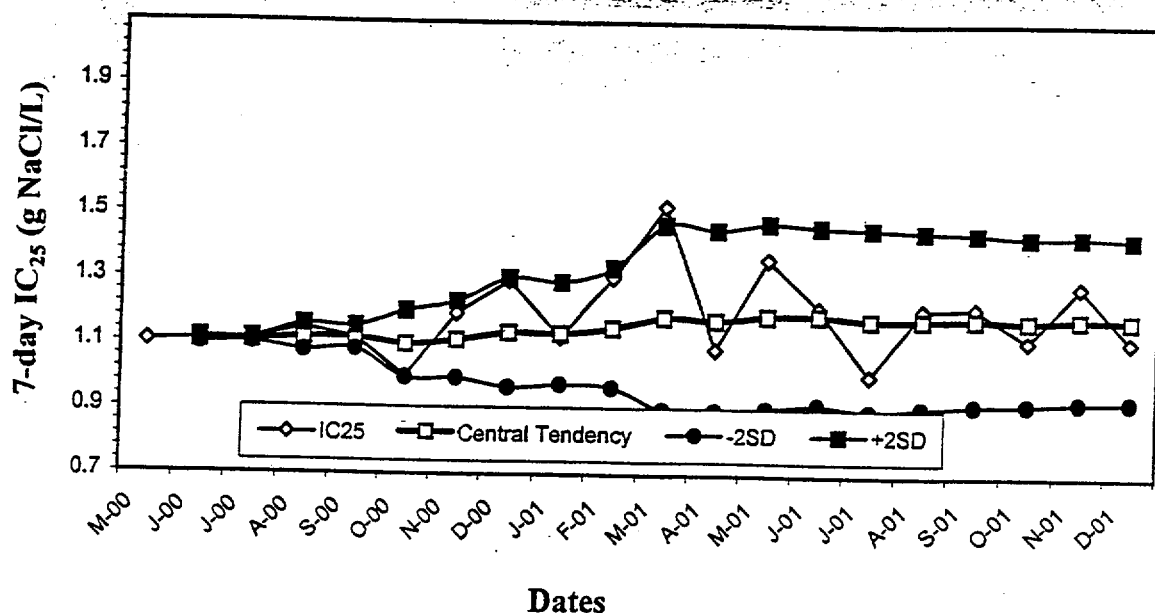
NOTES:

Ceriodaphnia dubia Sodium Chloride Chronic Reference Toxicant

Control Chart

CV% = 10.6

Source: S&ME Inc. Cultures



Dates	Values	Mean	-2 SD	+2 SD
5/19/00	1.1038			
6/16/00	1.1100	1.1069	1.0982	1.1156
07/14/00	1.1106	1.1081	1.1007	1.1156
8/11/00	1.1483	1.1182	1.0776	1.1588
09/29/00	1.1180	1.1181	1.0829	1.1533
10/20/00	0.9996	1.0984	0.9966	1.2002
11/27/00	1.1931	1.1119	0.9946	1.2292
12/18/00	1.2921	1.1344	0.9670	1.3019
1/15/01	1.1200	1.1328	0.9759	1.2897
2/23/01	1.3046	1.1500	0.9665	1.3336
3/14/01	1.5233	1.1839	0.8994	1.4685
4/17/01	1.0857	1.1758	0.8985	1.4530
5/20/01	1.3621	1.1901	0.9053	1.4749
6/15/01	1.2154	1.1919	0.9179	1.4659
7/17/01	1.0089	1.1797	0.8993	1.4601
8/14/01	1.2115	1.1817	0.9103	1.4531
9/24/01	1.2183	1.1838	0.9205	1.4472
10/29/01	1.1179	1.1802	0.9228	1.4376
11/27/01	1.2857	1.1857	0.9310	1.4405
12/10/01	1.1171	1.1823	0.9324	1.4322

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: Chronic Reference Test

Test Conducted From: 12/10/01 (Day 0) To 12/17/01 (Day 7)

Sites/Concentrations: 1. Control 4. 1000 mg/L
2. 500 mg/L 5. 1500 mg/L
3. 750 mg/L 6. 2000 mg/L

Stock (if applicable): 10,000 mg/L stock prepared 12/10/01

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☒

Other (describe): _____ ☐

Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals ☒

Other (describe): _____ ☐

Source of Test Organisms: S&ME brood board nos. 169

Age of Test Organisms:

Isolated neonates for test on 12/10/01 (date) from 0830 to 1400 (time) Initials LSO

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: Levi S. Dineen (Reviewer Initials) on 12/19/01 (Date)

REV.01, January 00 (ceriodaphnia test info sheet)

Ceriodaphnia Daily Test Information Logsheet

Test Name: Chronic Reference Test

Test Dates: 12/10/01 - 12/17/01

Daily Test information		Temperature Information (cup -25±1°C)		Feeding Information				Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL YCT	YCT Date	Fed 100 uL Selenastrum	Selenastrum Date	Start Time	End Time	Carboy # Date Prep.	
	a.m.	p.m.									
Day 0 LSO 12/10/01	—	25.1	4	1600	7/17/01	1600	11/20/01	1530	1600	1	12/9/01
Day 1 BAD 12/11/01	25.2	25.2	4	1615	7/17/01	1615	11/20/01 7/17/01 BAD	1545	1615	1	12/10/01
Day 2 VCS 12/12/01	25.1	25.3	4	1620	7/17/01	1620	11/20/01	1545	1620	1	12/10/01
Day 3 VCS 12/13/01	25.1	25.1	4	1540	7/17/01	1540	11/20/01	1570	1540	1	12/10/01
Day 4 VCS 12/14/01	25.1	25.2	4	1530	7/17/01	1530	11/20/01	1500	1530	1	12/13/01
Day 5 BAD 12/15/01	25.3	25.2	4	1500	7/17/01	1500	11/20/01	1430	1500	1	12/13/01
Day 6 AIR 12/16/01	25.2	25.2	4	1450	7/17/01	1450	11/20/01	1430	1450	1	12/13/01
Day 7 VCS 12/17/01	25.2	25.2	4					1530		VCS +	—

Ceriodaphnia 3-Brood Survival and Reproduction **Raw Data Sheet**

Client: Reference Test

Location: S&ME Inc.

Analysts: LSO VCS BDD DSG

Conc.	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
Control	BDD	1	0										0	10	10	0
	LSO	2	0										0	10	10	0
	LSO	3	0										0	10	10	0
	VCS	4	4	5	4	6	5	4	4	5	3	0	40	10	10	4.0
	DSG	5	8	7	10	8	7	0	0	8	7	10	65	10	10	6.5
	DSG	6	12	11	0	10	0	9	11	0	12	0	65	10	10	6.5
	DSG	7	0	0	12	0	13	13	12	14	0	14	78	10	10	7.8
	Total		24	23	26	24	25	26	27	27	22	24	248	10	10	24.8

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
500	BDD	1	0										0	10	10	0
	LSO	2	0										0	10	10	0
	LSO	3	0										0	10	10	0
	VCS	4	5	4	4	3	5	4	3	5	6	5	44	10	10	4.4
	DSG	5	9	8	18	8	8	9	7	0	8	0	67	10	10	6.7
	DSG	6	0	7	0	9	9	0	12	13	0	10	50	10	10	5.0
	DSG	7	11	10	12	0	0	14	0	8	12	11	78	10	10	7.8
	Total		25	24	26	20	22	27	22	26	26	26	249	10	10	24.9

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
750	BDD	1	0										0	10	10	0
	LSO	2	0										0	10	10	0
	LSO	3	0										0	10	10	0
	VCS	4	4	4	3	2	4	5	5	4	4	5	40	10	10	4.0
	DSG	5	8	10	0	9	0	8	7	9	0	0	51	10	10	5.1
	DSG	6	10	0	11	11	12	0	0	11	10	9	74	10	10	7.4
	DSG	7	0	13	10	0	11	14	14	0	11	11	84	10	10	8.4
	Total		22	27	24	22	27	27	26	24	25	25	249	10	10	24.9

Ceriodaphnia 3-Brood Survival and Reproduction Raw Data Sheet

Client: Reference Test

Location: S&ME Inc.

Analysts: LSD, VCS, BAD, DSC

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
1000	Bad	1	0										0	10	10	0
	LSD	2	0										0	10	10	0
	LSD	3	0										0	10	10	0
	VCS	4	4	3	0	5	4	5	3	2	4	3	33	10	10	3.3
	DSC	5	5	6	4	4	0	0	4	4	6	5	41	10	10	4.1
	DSC	6	5	0	6	7	6	10	9	0	10	6	59	10	10	5.9
	DSC	7	9	10	9	1	1	8	4	12	0	8	72	10	10	7.2
	Total		23	19	19	17	21	23	20	21	20	22	205	10	10	20.5

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
1500	Bad	1	0										0	10	10	0
	LSD	2	0										0	10	10	0
	LSD	3	0										0	10	10	0
	VCS	4	3	4	3	2	4	3	0	4	3	3	29	10	10	2.9
	DSC	5	0	0	1	2	0	4	3	4	0	0	14	10	10	1.4
	DSC	6	6	7	7	0	5	0	4	0	0	7	45	10	10	4.5
	DSC	7	7	5	1	8	9	7	6	9	4	7	63	10	10	6.3
	Total		16	16	12	12	18	14	13	17	16	17	151	10	10	15.1

	Init.	Day	Replicate										No. of Young	No. of live Adults	No. of Original Adults	Young Per Adult
			1	2	3	4	5	6	7	8	9	10				
2000	Bad	1	0										0	10	10	0
	LSD	2	X	X	X	X	X	X	X	X	X	X	0	0	10	0
		3											0	0	10	0
		4											0	0	10	0
		5											0	0	10	0
		6											0	0	10	0
		7	X	X	X	X	X	X	X	X	X	X	0	0	10	0
	Total		0	0	0	0	0	0	0	0	0	0	0	0	10	0

Caridophnia Survival and Reproduction Test-Reproduction

Start Date: 12/10/01 15:30 Test ID: Ref1201cr Sample ID: REF-Ref Toxicant
 End Date: 12/17/01 15:30 Lab ID: S&ME INC. Sample Type: NACL-Sodium chloride
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-mg/L	1	2	3	4	5	6	7	8	9	10
D-Control	24.000	23.000	26.000	24.000	25.000	26.000	27.000	27.000	22.000	24.000
500	25.000	29.000	26.000	20.000	22.000	27.000	22.000	26.000	26.000	26.000
750	22.000	27.000	24.000	22.000	27.000	27.000	26.000	24.000	25.000	25.000
1000	23.000	19.000	19.000	17.000	21.000	23.000	20.000	21.000	20.000	22.000
1500	16.000	16.000	12.000	12.000	18.000	14.000	13.000	17.000	16.000	17.000
2000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

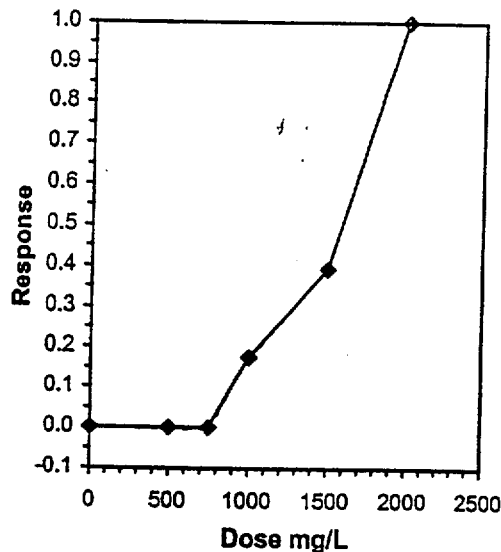
Conc-mg/L	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
D-Control	24.800	1.0000	24.800	22.000	27.000	6.801	10				24.867	1.0000
500	24.900	1.0040	24.900	20.000	29.000	10.949	10	-0.106	2.223	2.100	24.867	1.0000
750	24.900	1.0040	24.900	22.000	27.000	7.679	10	-0.106	2.223	2.100	24.867	1.0000
*1000	20.500	0.8266	20.500	17.000	23.000	9.270	10	4.552	2.223	2.100	20.500	0.8244
*1500	15.100	0.6089	15.100	12.000	18.000	14.459	10	10.268	2.223	2.100	15.100	0.6072
2000	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests

					-Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)					0.95611	0.93	-0.3933	-0.5821		
Bartlett's Test indicates equal variances ($p = 0.65$)					2.45569	13.2767				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	750	1000	866.025		2.10037	0.08469	186.28	4.46222	1.3E-14	4, 45

Linear Interpolation (80 Resamples)

Point	mg/L	SD	95% CL		Skew
IC05	821.183	69.9968	681.554	830.39	-4.7078
IC10	892.366	30.9724	820.33	926.357	0.8830
IC15	963.55	35.013	891.735	1022.56	1.1642
IC20	1056.17	46.035	960.829	1116.43	0.4145
IC25	1171.3	46.0524	1060.11	1237.08	-0.1350
IC40	1505.96	39.2483	1396.43	1541.33	-1.1204
IC50	1588.3	19.4053	1547.28	1617.78	-0.4628



Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: Reference Test

Location: S&ME Inc.

Template No.:

Analysts: LSN YCS BAD DEX

Dates/times: 10/01/2000 14:30 - 15:00

Age of Neonates: <24 hrs 1530 30

[illegible]

Daily Chemistry Data - Ceriodaphnia 7-day Chronic

Client: Reference Test

Location: S&ME Inc.

Template No.: 1

Analysts: LSD, VCS, BMD, DSG

Dates/times: 12/10/01 1430-12/17/01 1152

Age of Neonates: <24 hrs 1990

30

Day									
1000 mg/L	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.3	24.3	25.1	25.1	24.8	24.8		
Final		24.7	25.0	25.1	24.7	24.6	24.6	24.6	
D.O. Initial	7.1	7.4	7.5	7.7	7.2	7.4	7.2		
Final		7.1	7.5	7.1	7.0	7.3	6.8	7.3	
pH Initial	8.1	8.1	8.0	8.1	8.0	8.1	8.0		
Final		8.0	8.0	8.1	7.9	8.0	8.0	8.1	
Conductivity	1990	2000	2030	2020	2010	2020	2020		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	DSG	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
1500 mg/L	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.4	24.3	25.1	25.0	24.9	24.6		
Final		24.6	24.9	25.0	24.6	24.7	24.7	25.0	
D.O. Initial	7.1	7.4	7.5	7.2	7.2	7.4	7.1		
Final		7.0	7.4	7.0	7.0	7.5	6.8	7.2	
pH Initial	8.0	8.1	8.0	8.0	8.0	8.1	8.0		
Final		8.0	8.0	8.1	7.9	8.0	8.0	8.1	
Conductivity	2920	2890	2930	2860	2910	2880	2910		
Analyst Initials	LSD	LSD	LSD	DSG	DSG	DSG	DSG	DSG	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
2000 mg/L	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.4	24.4	/						
Final		24.4	25.1						
D.O. Initial	7.1	7.4	/						
Final		7.0	7.5						
pH Initial	8.0	8.1	/						
Final		8.0	8.0						
Conductivity	3960	3680	/						
Analyst Initials	LSD	LSD	LSD						
QA Review Initials	LSD	LSD	LSD						
Stock Solution Date	12/10/01	12/10/01	12/10/01						

Sequoyah Nuclear Plant Biomonitoring
December 10-17, 2001

Appendix E

Invalid Fathead Minnow Toxicity Test
Bench Sheets

TOXICITY TEST RESULTS (See Appendix E for Bench Sheets)

1) Results of a Pimephales promelas Chronic 7-d Toxicity Test
(Genus) (Species) (Type/Duration)

Conducted 12/10/21 - 12/17/01 Using Effluent From Outfall 101.
(mm/dd/yy) (mm/dd/yy) (number)

Test Solutions	Percent Surviving (time intervals used – days)						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
Control	<u>97</u>	<u>95</u>	<u>95</u>	<u>95</u>	<u>95</u>	<u>92</u>	<u>92</u>
10.98%Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>	<u>95</u>	<u>90</u>
22.0% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>98</u>	<u>93</u>	<u>85</u>	<u>80</u>
43.9% Effluent	<u>100</u>	<u>100</u>	<u>98</u>	<u>90</u>	<u>80</u>	<u>73</u>	<u>68</u>
72.0% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>88</u>	<u>88</u>	<u>85</u>	<u>83</u>
100% Effluent	<u>100</u>	<u>100</u>	<u>100</u>	<u>95</u>	<u>75</u>	<u>70</u>	<u>70</u>
Intake	<u>100</u>	<u>100</u>	<u>88</u>	<u>60</u>	<u>48</u>	<u>43</u>	<u>40</u>

Test Solutions	IC ₂₅ Mean Dry Weight (mg) (Replication)				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>Mean</u>
Control	<u>0.691</u>	<u>0.719</u>	<u>0.675</u>	<u>0.749</u>	<u>0.709</u>
10.98%Effluent	<u>0.894</u>	<u>0.633</u>	<u>0.528</u>	<u>0.865</u>	<u>0.730</u>
22% Effluent	<u>0.677</u>	<u>0.466</u>	<u>0.909</u>	<u>0.516</u>	<u>0.642</u>
43.9% Effluent	<u>0.622</u>	<u>0.150</u>	<u>0.539</u>	<u>0.651</u>	<u>0.491</u>
72% Effluent	<u>0.378</u>	<u>0.819</u>	<u>0.612</u>	<u>0.607</u>	<u>0.604</u>
100% Effluent	<u>0.631</u>	<u>0.757</u>	<u>0.131</u>	<u>0.461</u>	<u>0.484</u>
Intake	<u>0.043</u>	<u>0.333</u>	<u>0.142</u>	<u>0.591</u>	<u>0.277</u>
IC ₂₅ Value: <u>75%</u>		Calculated TU Estimates [†] : <u>1.3 TUc</u>			
95% Confidence Limits Upper Limit = <u>NA</u> Lower Limit = <u>NA</u>		Permit Limit: <u>2.3 TUc</u>			

[†]NOTE: TUa = 100/LC₅₀; TUc = 100/ IC₂₅

REFERENCE TOXICANT TEST RESULTS

Species	Date	Time	Duration	Toxicant	Results (LC ₅₀ /IC ₂₅)
<i>Pimephales promelas</i>	12/09/01	1135	7 days	KCl	0.751 mg/L KCl

Water Chemistry Mean Values and Ranges for Fathead Minnow Test, Sequoyah Nuclear Plant (SQN), December 10 - 17, 2001

Test/ Sample ID	<u>Temperature</u>		<u>Dissolved Oxygen</u>		<u>pH</u>		<u>Conductance</u>	<u>Alkalinity</u>	<u>Hardness</u>	<u>Total Residual</u>
	Initial	Final	Initial	Final	Initial	Final	Initial	Initial	Initial	Chlorine
	(°C)	(°C)	(mg/L)	(mg/L)	S.U.	S.U.	(µmhos)	mg/L CaCO ₃	mg/L CaCO ₃	(mg/L)
Fathead/ Control	24.6 (24.1-25.3)	24.7 (24.0-25.3)	7.3 (7.2-7.7)	7.0 (6.5-7.9)	8.0 (7.9-8.2)	7.6 (7.5-7.8)	325 (319-338)	66.4 (62-70)	94.6 (90-100)	-
Fathead/ 10.98%	24.7 (24.1-25.2)	24.8 (24.0-25.3)	7.3 (7.2-7.6)	7.1 (6.6-7.7)	8.1 (7.9-8.2)	7.5 (7.4-7.8)	317 (311-325)	-	-	-
Fathead/ 22.0 %	24.7 (24.1-25.3)	25.1 (24.9-25.3)	7.3 (7.2-7.6)	7.0 (6.6-7.6)	8.1 (7.9-8.2)	7.5 (7.4-7.7)	304 (298-311)	-	-	-
Fathead/ 43.9%	24.8 (24.0-25.4)	24.9 (24.0-25.7)	7.3 (7.2-7.7)	6.7 (6.4-7.6)	8.0 (7.9-8.1)	7.5 (7.3-7.6)	273 (269-277)	-	-	-
Fathead/ 72.0 %	24.9 (24.0-25.2)	24.9 (24.0-25.6)	7.4 (7.2-7.9)	6.8 (6.5-7.6)	7.9 (7.7-8.0)	7.7 (7.4-8.0)	234 (225-242)	-	-	-
Fathead/ 100.0 %	24.7 (24.0-25.2)	24.7 (24.0-25.2)	7.4 (7.2-8.0)	6.9 (6.5-7.9)	7.7 (7.6-7.8)	7.5 (7.4-7.9)	197 (191-205)	66.3 (63-69)	76.7 (70-80)	0.07 (0.05-0.08)
Fathead/ Intake	24.8 (24.1-25.1)	24.9 (24.5-25.2)	7.4 (7.0-8.2)	7.1 (6.7-7.7)	7.7 (7.5-7.8)	7.6 (7.3-8.2)	196 (190-206)	68.3 (67-70)	76.0 (72-80)	0.09 (0.05-0.12)

FATHEAD MINNOW TEST INFORMATION

Test Name: TVA- Sequoyah Nuclear Plant

Test Conducted From: 12/10/01 (Day 0) To 12/17/01 (Day 7)

Sites/Concentrations: 1. Control 4. 43.9% 7. Intake
2. 10.95% 5. 72%
3. 22% 6. 100%

Stock (if applicable): _____

Control Water Type (✓):

Moderately Hard Water + Trace Minerals ☒

Other (describe): _____ ☐

Dilution Water Type (✓):

Moderately Hard Water + Trace Minerals ☒

Other (describe): _____ ☐

Source of Test Larvae (✓):

S&ME Lot # 01-227 ☐

Other (describe): _____ ☐

Date Larvae Hatched: 12/9/01 - 12/10/01 Hatch Time: 1600 - 1800 Initials: LSO

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: Jane S. Dwyer (Reviewer Initials) on 12/13/01 (Date)

Fathead Minnow Daily Test Information Logsheet

Test Name: TVA-Sequoyah Nuclear Plant

Test Dates: 12/10/01 - 12/17/01

Daily Test information		Temperature Information (25±1°C)		Feeding Information (feeding interval 6± 1h)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments	
Date and Initials	Incubator Temp. (°C)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time	Carboy #	Date Prep.
	a.m.	p.m.							
Day 0 ^{LSO} 12/10/01	—	25.1	4		am: — pm: 1615	1400	1430	2	12/9/01
Day 1 ^{BW} 12/11/01	25.2	25.2	4		✓ am: 0930 ✓ pm: 1200	1425	1450	4	12/9/01
Day 2 ^{LS} 12/12/01	25.1	25.3	4		✓ am: 1000 ✓ pm: 1630	1440	1505	4	12/11/01
Day 3 ^{LS} 12/13/01	25.1	25.1	4		✓ am: 0930 ✓ pm: 1600	1335	1500	2	12/11/01
Day 4 ^{LS} 12/14/01	25.1	25.2	4		✓ am: 0830 pm: 1500	1325	1401	4	12/12/01
Day 5 ^{BW} 12/15/01	25.3	25.2	4		✓ am: 0915 ✓ pm: 1500	1400	1435	^{LSO} 42	12/13/01
Day 6 ^{LSR} 12/16/01	25.2	25.2	4		✓ am: 930 pm: 1100	1300	1335	41	12/14/01
Day 7 ^{LS} 12/17/01	25.2	25.2	4			1435		^{LSO} 2411 12/17/01	^{DS} 12/17/01

Client: TVA/Sequoyah Nuclear Plant

Analysts: DSG, VCS, BAD, LSD

Location: Soddy Daisy, Tennessee

Dates: 12/10/01 - 12/17/01

CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

CONC.	Initials	DAY NO.	REPLICATE			
			A	B	C	D
Mod. Hard	BAD	1	1	0	0	1*
	BAD	2	1	0	1	1*
	DSG	3	1	0	1	1*
	DSG	4	1	0	1	1*
	LSD	5	1	0	1	1*
	ALR	6	1	1	1	1*
	DSG	7	1	1	1	1*
10.98% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	0	0	0	0
	LSD	5	0	0	0	0
	ALR	6	0	1	0	1
	DSG	7	0	1	2	1
22.0% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	0	1	0	0
	LSD	5	1	1	0	1
	ALR	6	2	1	0	3
	DSG	7	2	3	0	3
43.9% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	1	0	0
	DSG	4	0	4	0	0
	LSD	5	1	7	0	0
	ALR	6	1	7	2	1
	DSG	7	2	8	2	1
72% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	5	0	0	0
	LSD	5	5	0	0	0
	ALR	6	5	0	1	0
	DSG	7	5	0	1	1

CONC.	Initials	DAY NO.	REPLICATE			
			A	B	C	D
100% Outfall	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	0	0
	DSG	4	0	0	2	0
	LSD	5	0	0	7	3
	ALR	6	1	1	7	3
	DSG	7	1	1	7	3
100% Intake	BAD	1	0	0	0	0
	BAD	2	0	0	0	0
	DSG	3	0	0	5	0
	DSG	4	5	4	7	0
	LSD	5	8	46	7	0
	ALR	6	9	6	7	0
	DSG	7	9	6	7	1
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

*injured removed from replicate

Day 5 and Day 6 - used new cups since fungus was adhering to the sides of cups. Brine shrimp was also adhering to the fungus too

FATHEAD MINNOW SEVEN DAY TEST

RAW DATA

SURVIVAL AND GROWTH

Client: TVA - Sequoyah Nuclear Plant

Test Conducted By: VCS, LSD, BAD, DSG, ALR

Date Weighed 12/17/01 + 12/18/01

Weights Conducted by: ALR, LSD

Oven Temp

Test Dates: 12/10/01 - 12/17/01 (°C) 101

Comments:

Began drying (date/time) 12/17/01 / 1510

End of drying (date/time) 12/18/01 / 0645

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Groups Dry Weight		
					Dry Weight Pan + Fish (mg)	(Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
Control	A	9	10	1256.13	1263.04	6.91	0.691
(Moderately Hard)	B	9	10	1253.19	1260.33	7.19	0.719
	C	9	10	1244.24	1250.99	6.75	0.675
	D	9	9	1253.35	1260.09	6.74	0.749
10.98%	A	10	10	1260.57	1269.51	8.94	0.894
Outfall 101	B	9	10	1251.97	1253.30	6.33	0.633
	C	8	10	1257.54	1262.32	5.28	0.528
	D	9	10	1254.22	1262.87	8.65	0.865
22.0%	A	8	10	1257.75	1264.52	6.77	0.677
Outfall 101	B	7	10	1263.12	1267.78	4.66	0.466
	C	10	10	1264.74	1273.83	9.09	0.909
	D	7	10	1247.60	1252.76	5.16	0.516
43.9%	A	8	10	1243.98	1250.20	6.22	0.622
Outfall 101	B	2	10	1244.92	1246.42	1.50	0.150
	C	8	10	1255.20	1260.59	5.39	0.539
	D	9	10	1252.46	1258.97	6.51	0.651
72%	A	5	10	1252.68	1252.46	3.78	0.378
Outfall 101	B	10	10	1257.38	1265.57	8.19	0.819
	C	9	10	1268.50	1274.62	6.12	0.612
	D	9	10	1258.25	1264.32	6.07	0.607
100%	A	9	10	1270.20	1276.51	6.31	0.631
Outfall 101	B	7	10	1251.27	1258.84	7.57	0.757
	C	3	10	1260.64	1261.95	1.31	0.131
	D	7	10	1260.22	1264.38	4.16	0.416

FATHEAD MINNOW SEVEN DAY TEST RAW DATA SURVIVAL AND GROWTH

Client: TVA - Sequoyah Nuclear Plant

Test Conducted By: VCS LSD BAD DSG ALR

Date Weighed 12/17/01 - 12/18/01

Weights Conducted by: ALR LSD

Oven Temp

Test Dates: 12/10/01 - 12/17/01 (°C) 101

Comments:

Began drying (date/time) 12/17/01 / 1610

End of drying (date/time) 12/18/01 / 0645

Exposure & Repl.	Rep.	# Live Fish	# Original Fish	Pan Tare Weight (mg)	Dry Weight Pan + Fish (mg)	Groups Dry Weight (Pan + Fish minus Tare) (mg)	Mean Dry Weight (mg)
	A	1	10	1258.54	1258.97	0.43	0.043
Intake	B	4	10	1266.77	1270.10	3.33	0.333
100%	C	2	10	1258.07	1259.49	1.42	0.142
	D	9	10	1267.03	1272.94	5.91	0.591
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						
	A						
	B						
	C						
	D						

Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 12/10/01 14:00 Test ID: SQN1201fg Sample ID: TN0026450-NPDES Permit #
 End Date: 12/17/01 14:35 Lab ID: S&ME Inc. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

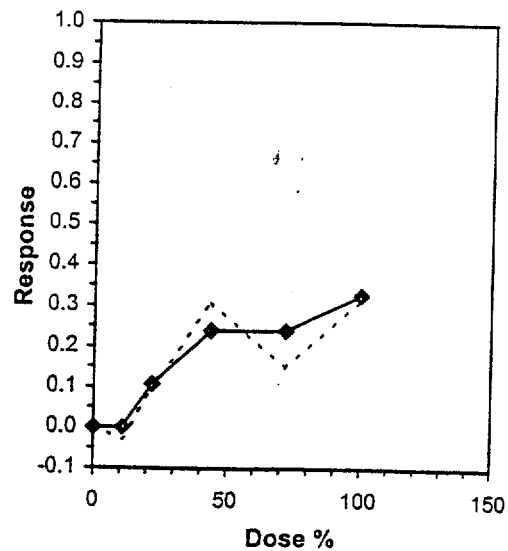
Conc-%	1	2	3	4
D-Control	0.6910	0.7190	0.6750	0.7489
10.98	0.8940	0.6330	0.5280	0.8650
22	0.6770	0.4660	0.9090	0.5160
43.9	0.6220	0.1500	0.5390	0.6510
72	0.3780	0.8190	0.6120	0.6070
100	0.6310	0.7570	0.1310	0.4160

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed		Isotonic	
			Mean	Min	Max	CV%	N		Critical	MSD	Mean	N-Mean
D-Control	0.7085	1.0000	0.7085	0.6750	0.7489	4.588	4				0.7192	1.0000
10.98	0.7300	1.0304	0.7300	0.5280	0.8940	24.420	4	-0.154	2.410	0.3365	0.7192	1.0000
22	0.6420	0.9062	0.6420	0.4660	0.9090	31.070	4	0.476	2.410	0.3365	0.6420	0.8926
43.9	0.4905	0.6923	0.4905	0.1500	0.6510	47.280	4	1.561	2.410	0.3365	0.5472	0.7609
72	0.6040	0.8525	0.6040	0.3780	0.8190	29.828	4	0.748	2.410	0.3365	0.5472	0.7609
100	0.4837	0.6828	0.4837	0.1310	0.7570	56.659	4	1.609	2.410	0.3365	0.4837	0.6726

Auxiliary Tests

					Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.96236	0.884	-0.4075	-0.4154		
Bartlett's Test indicates equal variances (p = 0.16)					7.96597	15.0863				
Hypothesis Test (1-tail, 0.05)										
Dunnett's Test	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
	100	>100		1	0.33653	0.47501	0.0443	0.039	0.37737	5, 18

Linear Interpolation (80 Resamples)					
Point	%	SD	95% CL(Exp)	Skew	
IC05	16.111	7.134	0.000	34.339	0.5410
IC10	21.242				
IC15	29.084				
IC20	37.396				
IC25	75.449				
IC40	>100				
IC50	>100				



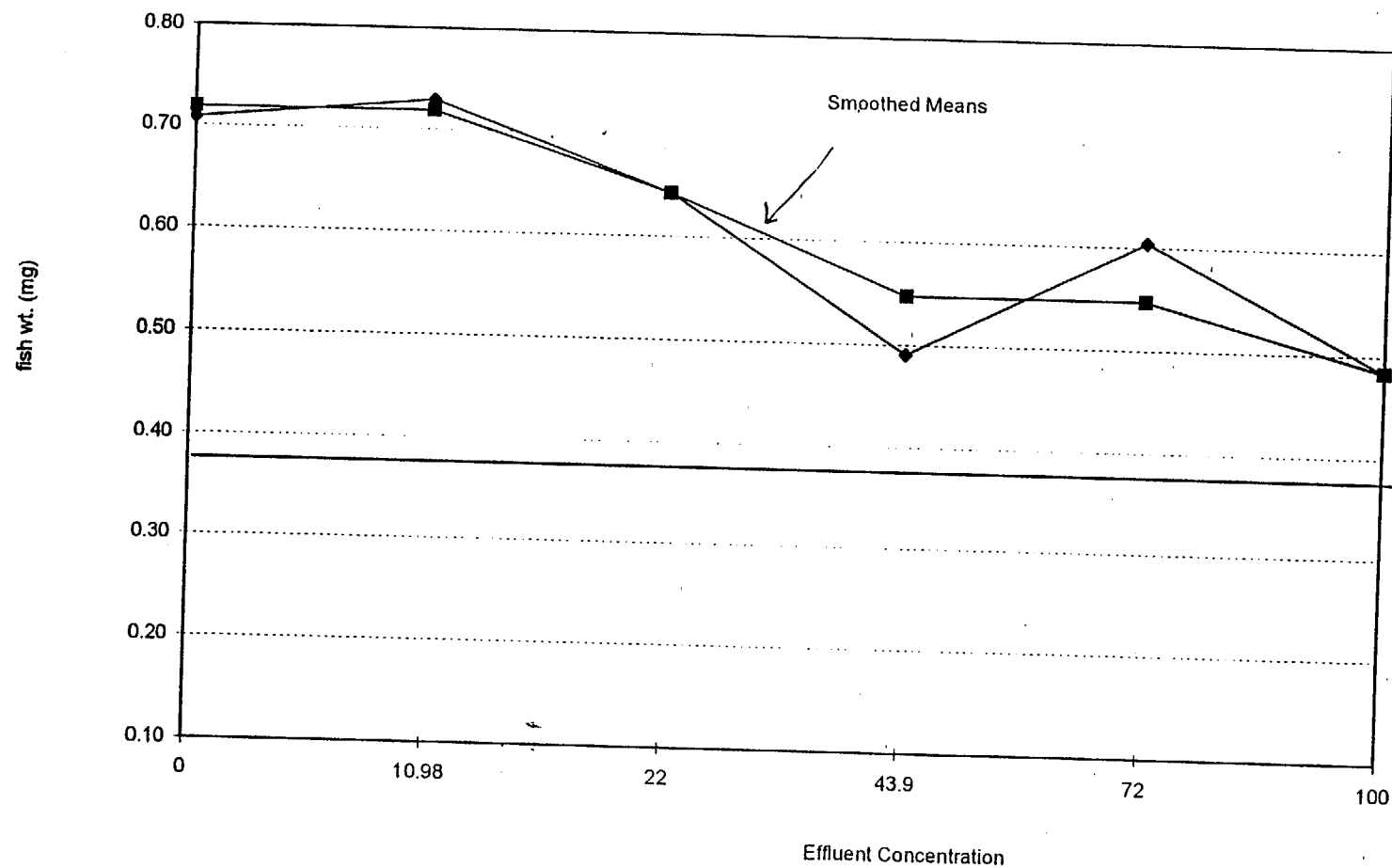
MSD range 9.4% - 35%

MSD = 0.3365

PMSD = $\frac{MSD}{\text{Control } \bar{x}} \times 100 = 46.8\%$

SQN DSN101 Dose Response Curve Chart 1

Sequoyah NP, DSN101, Fathead Growth



373

C - MSD = Sig

Larval Fish Growth and Survival Test-7 Day Survival

Start Date: 12/10/01 14:00	Test ID: SQN1201fs	Sample ID: TN0026450
End Date: 12/17/01 14:35	Lab ID: S&ME INC.	Sample Type: EFF3-Power Plant
Sample Date:	Protocol: EPAF 91-EPA Freshwater	Test Species: PP-Pimephales promelas
Comments:		

Conc-%	1	2	3	4
D-Control	0.9000	0.9000	0.9000	1.0000
10.98	1.0000	0.9000	0.8000	0.9000
22	0.8000	0.7000	1.0000	0.7000
43.9	0.8000	0.2000	0.8000	0.9000
72	0.5000	1.0000	0.9000	0.9000
100	0.9000	0.9000	0.3000	0.7000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	0.9250	1.0000	1.2876	1.2490	1.4033	5.992	4			
10.98	0.9000	0.9730	1.2543	1.1071	1.4120	9.935	4	0.193	2.410	0.4160
22	0.8000	0.8649	1.1254	0.9912	1.4120	17.662	4	0.940	2.410	0.4160
43.9	0.6750	0.7297	0.9817	0.4636	1.2490	35.836	4	1.772	2.410	0.4160
72	0.8250	0.8919	1.1739	0.7854	1.4120	23.013	4	0.659	2.410	0.4160
100	0.7000	0.7568	1.0172	0.5796	1.2490	31.069	4	1.566	2.410	0.4160

Auxiliary Tests					Statistic		Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.91089		0.884	-0.9339	-0.58272		
Bartlett's Test indicates equal variances (p = 0.23)					6.93356		15.0863				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	0.33618	0.36464	0.06107	0.0596	0.43258	5, 18

Larval Fish Growth and Survival Test-7 Day Survival

Start Date: 12/10/01 14:00 Test ID: SQN1201ifs Sample ID: TN0026450-NPDES Permit #
 End Date: 12/17/01 14:35 Lab ID: S&ME Inc. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4
D-Control	0.9000	0.9000	0.9000	1.0000
Intake	0.1000	0.4000	0.2000	0.9000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	0.9250	1.0000	1.2876	1.2490	1.4033	5.992	4			
*Intake	0.4000	0.4324	0.6798	0.3218	1.2490	59.994	4	2.929	1.943	0.4033

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.87838	0.749	1.23279	2.88667
F-Test indicates equal variances ($p = 0.02$)	27.9435	47.4683		

Hypothesis Test (1-tail, 0.05)

Homoscedastic t Test indicates significant differences

Larval Fish Growth and Survival Test-7 Day Growth

Start Date: 12/10/01 14:00 Test ID: SQN1201Inf Sample ID: TN0026450-NPDES Permit #
 End Date: 12/17/01 14:35 Lab ID: S&ME Inc. Sample Type: EFF3-Power Plant
 Sample Date: Protocol: EPAF 91-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4
D-Control	0.6910	0.7190	0.6750	0.7489
Intake	0.0430	0.3330	0.1420	0.5910

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%			Critical	MSD
D-Control	0.7085	1.0000	0.7085	0.6750	0.7489	4.588	4			
*Intake	0.2773	0.3913	0.2773	0.0430	0.5910	87.042	4	3.542	2.353	0.2865

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.01$)	0.92908	0.749	0.7408	2.0285
F-Test indicates unequal variances ($p = 8.03E-03$)	55.1143	47.4683		

Hypothesis Test (1-tail, 0.05)

Heteroscedastic t Test indicates significant differences

Fish Water Chemistry

SQN- December 10 - 17, 2001 INITIAL AND FINAL WATER CHEMISTRY (FATHEAD)

Initial Chemistry

Fish - Control	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	24.1	24.3	25.1	25.3	24.1	25.0	24.1	25.3	24.6
DO	7.2	7.4	7.7	7.2	7.2	7.3	7.2	7.2	7.7	7.3
pH	8.0	8.0	7.9	7.9	8.1	8.2	8.1	7.9	8.2	8.0
Cond	325	325	320	321	319	338	327	319	338	325
Hard	98	100	98	92	90	92	92	90	100	94.6
Alk	62	67	65	67	67	70	67	62	70	66.4

Concentration 10.98%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	24.3	24.9	25.2	25.1	24.1	25.0	24.1	25.2	24.7
DO	7.2	7.3	7.6	7.2	7.2	7.2	7.2	7.2	7.6	7.3
pH	8.0	8.0	7.9	8.1	8.2	8.2	8.1	7.9	8.2	8.1
Cond	314	315	311	313	317	324	325	311	325	317

Concentration 22%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.3	24.5	24.9	25.1	25.3	24.1	25.0	24.1	25.3	24.7
DO	7.2	7.3	7.6	7.2	7.2	7.3	7.2	7.2	7.6	7.3
pH	8.0	8.0	7.9	8.0	8.2	8.2	8.1	7.9	8.2	8.1
Cond	301	304	298	300	305	308	311	298	311	304

Concentration 43.9%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.5	24.5	25.1	25.4	25.0	24.0	25.0	24.0	25.4	24.8
DO	7.2	7.2	7.7	7.2	7.2	7.5	7.2	7.2	7.7	7.3
pH	7.9	7.9	7.9	8.0	8.1	8.1	8.1	7.9	8.1	8.0
Cond	273	277	270	274	274	269	271	269	277	273

Concentration 72%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.7	25.0	25.2	25.1	25.0	24.0	25.1	24.0	25.2	24.9
DO	7.2	7.3	7.9	7.2	7.2	7.5	7.2	7.2	7.9	7.4
pH	7.8	7.9	7.8	7.7	8.0	7.9	8.0	7.7	8.0	7.9
Cond	235	225	242	229	238	235	237	225	242	234

Concentration 100%	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.6	24.8	25.2	24.0	25.0	24.1	25.1	24.0	25.2	24.7
DO	7.2	7.2	8.0	7.2	7.2	7.7	7.2	7.2	8.0	7.4
pH	7.6	7.6	7.7	7.8	7.8	7.8	7.8	7.6	7.8	7.7
Cond	197	195	204	205	196	192	191	191	205	197
Hard	70		80		80			70	80	76.7
Alk	63		69		67			63	69	66.3
TRC	0.07		0.08		0.07			0.05	0.08	0.07

Fish Water Chemistry

Intake	0	1	2	3	4	5	6	MIN	MAX	MEAN
Temp	24.2	25.0	25.1	25.1	25.1	24.1	25.0	24.1	25.1	24.8
DO	7.0	7.1	8.2	7.2	7.2	7.7	7.2	7.0	8.2	7.4
pH	7.5	7.6	7.7	7.7	7.8	7.8	7.8	7.5	7.8	7.7
Cond	190	199	197	206	196	193	194	190	206	196
Hard	72		80		76			72	80	76.0
Alk	67		70		68			67	70	68.3
TRC	0.15		0.06		0.05			0.05	0.12	0.09

Final Chemistry

FISH

Fish - Medium	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.4	24.7	25.3	24.8	24.4	25.2	24.0	24.0	25.3	24.7
DO	6.5	7.1	6.8	7.1	7.0	6.6	7.9	6.5	7.9	7.0
pH	7.6	7.7	7.6	7.8	7.5	7.6	7.5	7.5	7.8	7.6

Concentration 10.98%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.1	24.8	25.3	24.8	24.6	25.3	24.0	24.0	25.3	24.8
DO	6.6	7.4	7.1	7.0	6.8	6.8	7.7	6.6	7.7	7.1
pH	7.8	7.5	7.6	7.5	7.4	7.5	7.5	7.4	7.8	7.5

Concentration 22%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	25.0	25.0	25.3	25.1	24.9	25.3	24.0	24.9	25.3	25.1
DO	6.6	7.4	6.9	6.8	6.8	6.7	7.6	6.6	7.6	7.0
pH	7.7	7.4	7.5	7.5	7.4	7.5	7.6	7.4	7.7	7.5

Concentration 43.9%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	25.2	24.9	25.7	24.4	25.2	24.0	24.0	25.7	24.9
DO	6.5	7.0	6.7	6.5	6.4	6.5	7.6	6.4	7.6	6.7
pH	7.6	7.5	7.5	7.6	7.3	7.4	7.6	7.3	7.6	7.5

Concentration 72%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	25.0	25.0	25.6	24.5	25.3	24.0	24.0	25.6	24.9
DO	6.5	7.2	6.6	6.6	6.7	6.5	7.6	6.5	7.6	6.8
pH	7.6	7.4	7.5	7.6	7.9	7.8	8.0	7.4	8.0	7.7

Concentration 100%	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	24.5	24.8	25.1	24.5	25.2	24.0	24.0	25.2	24.7
DO	6.7	7.3	6.7	6.7	6.8	6.5	7.9	6.5	7.9	6.9
pH	7.4	7.4	7.5	7.7	7.4	7.4	7.9	7.4	7.9	7.5

Fish Water Chemistry

Intake	1	2	3	4	5	6	7	MIN	MAX	MEAN
Temp	24.9	24.5	25.0	25.1	24.7	25.2	24.6	24.5	25.2	24.9
DO	6.7	7.4	6.7	7.1	7.1	7.0	7.7	6.7	7.7	7.1
pH	7.6	7.5	7.6	7.7	7.3	7.3	8.2	7.3	8.2	7.6

Test Temperature Mean 24.9

 Minimum 24.0

 Maximum 25.7

Word Review by: Cur

Excel Reviewed by: Cur

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant

Analysts: VCS, LSP, BAO, DSG

Location: Soddy Daisy, Tennessee

Dates/times: 12/10/01 1400 - 12/17/01 1435

Template No.: 1

Age of larvae: 24 hrs

Day									
Control: (Mod. Hard)	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.1	24.3	25.1	25.3	24.1	25.0		
Final		24.4	24.7	25.3	24.8	24.4	25.2	24.0	
D.O. Initial	7.2	7.4	7.7	7.2	7.2	7.3	7.2		
Final		6.5	7.1	6.9	7.1	7.0	6.6	7.9	
pH Initial	8.0	8.0	7.9	7.9	8.1	8.2	8.1		
Final		7.6	7.7	7.6	7.8	7.5	7.6	7.5	
Alkalinity	62	67	65	67	67	70	67		
Hardness	48	100	98	92	90	92	92		
Conductivity-Initial	325	325	320	321	319	338	327		
Analyst Initials	LSD	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
10.98% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.3	24.9	25.2	25.1	24.1	25.0		
Final		25.1	24.8	25.3	24.8	24.6	25.3	24.0	
D.O. Initial	7.2	7.3	7.6	7.2	7.2	7.2	7.2		
Final		6.6	7.4	7.1	7.0	6.8	6.9	7.7	
pH Initial	8.0	8.0	7.9	8.1	8.2	8.2	8.1		
Final		7.8	7.5	7.6	7.5	7.4	7.5	7.5	
Conductivity-Initial	314	315	311	313	317	324	325		
Analyst Initials	LSD	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Day									
22.0% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.5	24.9	25.1	25.3	24.1	25.0		
Final		25.0	25.0	25.3	25.1	24.9	25.3	24.0	
D.O. Initial	7.2	7.3	7.6	7.2	7.2	7.3	7.2		
Final		6.6	7.4	6.4	6.8	6.8	6.7	7.6	
pH Initial	8.0	8.0	7.9	8.0	8.2	8.2	8.1		
Final		7.7	7.4	7.5	7.5	7.4	7.5	7.6	
Conductivity-Initial	301	304	298	300	305	308	311		
Analyst Initials	LSD	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	

Notes:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant

Analysts: VCS, LSO, BAO, DSG

Location: Soddy Daisy, Tennessee

Dates/times: 12/10/01 1400 - 12/17/01 1435

Template No.: 1

Age of larvae: <24 hrs

Day									
43.9% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.5	25.1	25.4	25.0	24.0	25.0		
Final		24.9	25.2	24.9	25.7	24.4	25.2	24.0	
D.O. Initial	7.2	7.2	7.7	7.2	7.2	7.5	7.2		
Final		6.5	7.0	6.7	6.5	7.0	6.5	7.6	Final D.O. day 5 = 6.4
pH Initial	7.9	7.9	7.9	8.0	8.1	8.1	8.1		
Final		7.6	7.5	7.5	7.6	7.3	7.4	7.6	
Conductivity-Initial	273	277	270	274	274	269	271		
Analyst Initials	LSO	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSO	LSO	LSO	LSO	LSO	LSO	LSO	LSO	
Day									
72% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.7	25.0	25.2	25.1	25.0	24.4	25.1		With temp day 5 = 24.0
Final		24.9	25.0	25.0	25.6	24.5	25.3	24.0	
D.O. Initial	7.2	7.3	7.9	7.2	7.2	7.5	7.2		
Final		6.5	7.2	6.6	6.6	7.5	6.5	7.6	Final D.O. day 5 = 6.7
pH Initial	7.8	7.9	7.8	7.7	8.0	7.9	8.0		
Final		7.6	7.4	7.5	7.6	7.9	7.8	8.0	
Conductivity-Initial	235	225	242	229	238	235	237		
Analyst Initials	LSO	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSO	LSO	LSO	LSO	LSO	LSO	LSO	LSO	
Day									
100% Outfall 001	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.6	24.8	25.2	24.0	25.0	24.1	25.1		
Final		24.9	24.5	24.8	25.1	24.5	25.2	24.0	Dec. day 3 = 7.2
D.O. Initial	7.2	7.2	8.0	7.8	7.2	7.7	7.2		
Final		6.7	7.3	6.7	6.7	6.8	6.5	7.9	
pH Initial	7.6	7.6	7.7	7.8	7.8	7.8	7.8		
Final		7.4	7.4	7.5	7.7	7.4	7.4	7.9	
Alkalinity	63		69		67				
Hardness	70		80		80				
Conductivity-Initial	197	195	204	205	196	192	191		
Chlorine	0.07		0.08		0.07				
Analyst Initials	LSO	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSO	LSO	LSO	LSO	LSO	LSO	LSO	LSO	
Sample Date	12/10/01	12/11/01	12/12/01	12/12/01	12/14/01	12/14/01	12/14/01		

Notes:

Daily Chemistry Data - Fathead Minnow 7-day Chronic

Client: TVA - Sequoyah Nuclear Plant

Analysts: VCS, LSD, BAO, DSG

Location: Soddy Daisy, Tennessee

Dates/times: 12/10/01 11400 - 12/17/01 11435

Template No.: 1

Age of larvae: <24 hrs

	Day								
Intake-100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.2	25.0	25.1	25.1	25.1	24.1	25.0		
Final		24.9	24.5	25.0	25.1	24.7	25.2	24.6	
D.O. Initial	7.0	7.1	8.2	7.2	7.2	7.7	7.2		
Final		6.7	7.4	6.7	7.1	7.1	7.0	7.7	
pH Initial	7.5	7.6	7.7	7.7	7.8	7.8	7.9		
Final		7.6	7.5	7.6	7.7	7.3	7.3	8.2	
Alkalinity	1.7	/	70	/	68	/	/		
Hardness	72	/	80	/	76	/	/		
Conductivity-Initial	190	199	197	206	196	193	194		
Chlorine	0.15	/	0.06	/	0.05	/	/		
Analyst Initials	LSD	BAO	BAO	DSG	VCS	BAO	DSG	VCS	
QA Review Initials	LSD	LSD	LSD	LSD	LSD	LSD	LSD	LSD	
Sample Date	12/10	12/10	12/12	12/12	12/14	12/14	12/14	/	

Notes

Sequoyah Nuclear Plant Biomonitoring
November 27- December 1, 2001

Appendix F

Void Tests
Chain of Custody Records and
Toxicity Bench Sheets

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: <u>IVA</u> Project Name: <u>SEQUOYAH NUCLEAR PLANT</u> P.O. Number: <u>PO BOX 2000</u> Facility Sampled: <u>SEQUOYAH NUCLEAR PLANT</u> NPDES Number: <u>TN0026450</u> Collected By: <u>WANDA ALLEN</u>	S & ME, Inc. 1413 Topside Road, Louisville, TN 37777 Phone: 865-970-0003 Fax: 865-970-0004	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> Bus <input type="checkbox"/> Client </div> Other (specify): _____
---	---	---

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	11/25/01 <i>0912</i>	11/26/01 <i>0822</i>	(1) 2.5 GAL				<input checked="" type="checkbox"/>		01-381	1.0°	VCS	0900	Good
SQN-INT-TOX	comp	4°C	11/25/01 <i>0949</i>	11/26/01 <i>0849</i>	(1) 2.5 GAL				<input checked="" type="checkbox"/>		01-382	1.0°	VCS	0900	Good

Sample Custody - Fill In From Top Down			
Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	<i>11/26/01 1200</i>	<i>[Signature]</i>	<i>11/27/01 900</i>

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: TVA

Project Name: SEQUOYAH NUCLEAR PLANT

P.O. Number: PO BOX 2000

Facility Sampled: SEQUOYAH NUCLEAR PLANT

NPDES Number: TN0026450

Collected By: WANDA ALLEN

S & ME, Inc.

1413 Topside Road, Louisville, TN 37777

Phone: 865-970-0003

Fax: 865-970-0004

☒ FedEx ☐ UPS ☐ Bus ☐ Client

Other (specify): _____

Field Identification / Sample Description	Grab/Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	11/27/01 0830	11/28/01 0730	(1) 2.5 GAL		✓				01-388	1°C	DHG	0930	good
SQN-INT-TOX	comp	4°C	11/27/01 0843	11/28/01 0743	(1) 2.5 GAL		✓				01-389	1°C	DHG	0930	good

Sample Custody - Fill In From Top Down			
Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<i>Wanda Allen</i>	11/28/01 1500	<i>Don Star</i>	11/28/01 0930

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

BIOMONITORING CHAIN OF CUSTODY RECORD

Page 1 of 1

Client: <u>IVA</u>	S & ME, Inc. 1413 Topside Road, Louisville, TN 37777 Phone: 865-970-0003 Fax: 865-970-0004	<input checked="" type="checkbox"/> FedEx	<input type="checkbox"/> UPS	<input type="checkbox"/> Bus	<input type="checkbox"/> Client
Project Name: <u>SEQUOYAH NUCLEAR PLANT</u>		Other (specify): _____			
P.O. Number: <u>PO BOX 2000</u>					
Facility Sampled: <u>SEQUOYAH NUCLEAR PLANT</u>					
NPDES Number: <u>TN0026450</u>					
Collected By: <u>WANDA ALLEN</u>					

Field Identification / Sample Description	Grab/ Comp.	Ship. Temp. (°C)	Collection Date/Time (If grab, list date/time under "End")		Container Number & Volume Collected	Flow (MGD)	Rain Event? (Mark as Appropriate)				Laboratory Use				
			Start	End			Yes	If Yes, Inches	No	Trace	S&ME Log Number	Arrival Temp. (°C)	By	Time	Appearance
SQN-DIS-101-TOX	comp	4°C	A-0838 11/29/01 B-0951	A 0838 11/30/01 50851	(2) (1) 2.5 GAL		✓				01-344	2°C	DAB	1400	Good
SQN-INT-TOX	comp	4°C	11/29/01 1006	11/30/01 0906	(1) 2.5 GAL		✓				01-345	2°C	DAB	1400	Good
			Samples did not arrive within the 36 hour												
			holding time for forest use. Fed Ex shipped												
			samples intact												

Sample Custody - Fill In From Top Down

Relinquished By (Signature):	Date/Time	Received By (Signature):	Date/Time
<u>Wanda Allen</u>	11/30/01 1500	<u>Ray Galt</u>	12/3/01 1400

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

FATHEAD MINNOW TEST INFORMATION

Test Name: TVA- Sequoyah Nuclear Plant

Test Conducted From: 11/27/01 (Day 0) To 12/04/01 (Day 7)

Sites/Concentrations: 1. control 4. 43.9% Intake 100%
2. 10.98% 5. 72%
3. 22% 6. 100% - 001

Stock (if applicable): _____

Control Water Type (✓):

Moderately Hard Water + Trace Minerals ☒

Other (describe): _____ ☐

Dilution Water Type (✓):

Moderately Hard Water + Trace Minerals ☒

Other (describe): _____ ☐

Source of Test Larvae (✓):

S&ME Lot # 01-221 ☐

Other (describe): _____ ☐

Date Larvae Hatched: 11/26/01 Hatch Time: 1500 Initials: VCS
11/27/01 130

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: _____ (Reviewer Initials) on _____ (Date)

Fathead Minnow Daily Test Information Logsheets

Test Name: TVA-Sequoyah Nuclear Plant

Test Dates: 11/27/01-12/04/01

Daily Test information	Temperature Information ($25 \pm 1^\circ\text{C}$)		Feeding Information (feeding interval $6 \pm 1\text{h}$)		Test Initiation, Water Change, or Test Termination		Control Water Carboy No. and Additional comments		
Date and Initials	Incubator Temp. ($^\circ\text{C}$)		Therm. No.	Fed 100 uL Brine Shrimp	Feeding time	Start Time	End Time		
	a.m.	p.m.					Carboy #	Date Prep.	
Day 0 VES 11/27/01	25.2	25.1	4	✓	am: — pm:	1130	1200	2	11/22/01
Day 1 DCS 11/28/01	25.1	25.1	4	✓	am: 0900 pm: 1600	1050	1123	2	11/22/01
Day 2 JAB 11/29/01	25.0	25.0	4	✓	am: 0900 pm: 1600	1115	1143	2	11/22/01
Day 3 OCB 11/30/01	25.6	25.0	4	✓	am: 0900 pm: 1600	1040	1112	2	11/22/01
Day 4 BSO 12/1/01	25.2	25.1	4	✓	am: 1000 pm:			2	11/29/01
Day 5					am: pm:				
Day 6					am: pm:				
Day 7									

Client: TVA/Sequoyah Nuclear Plant

Location: Soddy Daisy, Tennessee

Analysts: VCS, BAD, DSG

Dates: 11/27/01 - 12/04/01

CUMULATIVE MORTALITY OF P. PROMELAS IN CHRONIC TEST

		REPLICATE				
		DAY				
CONC.	Initials	NO.	A	B	C	D
Mod. Hard	VCS	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	0
	BAD	4	0	0	0	0
		5				
		6				
		7				
10.98% Outfall	DSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	0
	BAD	4	0	0	1	0
		5				
		6				
		7				
22.0% Outfall	DSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	1	0	0
	BAD	4	0	1	0	0
		5				
		6				
		7				
43.9% Outfall	DSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	0
	BAD	4	0	0	0	0
		5				
		6				
		7				
72% Outfall	DSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	1	0	1
	BAD	4	0	1	0	1
		5				
		6				
		7				

REPLICATE						
CONC.	Initials	DAY				
		NO.	A	B	C	D
100% Outfall	DSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	0	0	0	1
	BAD	4	0	0	0	1
		5				
		6				
		7				
100% Intake	DSG	1	0	0	0	0
	DSG	2	0	0	0	0
	DSG	3	1	0	0	0
	BAD	4	1	0	0	0
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		1				
		2				
		3				
		4				
		5				
		6				
		7				

Client: TVA - Sequoyah Nuclear Plant
 Location: Soddy Daisy, TN
 Test Type: Fathead Minnow 7-day Chronic

Analysts: VCS, DSG, BAD
 Dates/times: 11/27/01/1130 - 12/04/01/
 Age of Larvae: < 24 hrs

Day *									
Control: Mod. Hard	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.2	24.7	25.6	24.0	24.1				
Final		24.6	24.0	22.6	24.7				
D.O. Initial	7.2	7.2	7.1	7.1	7.3				
Final		6.7	6.6	6.6	6.8				
pH Initial	8.1	8.1	8.1	8.1	8.0				
Final		7.9	7.9	7.4	7.3				
Alkalinity	66	—	66	—	64				
Hardness	86	—	86	—	80				
Conductivity	320	315	321	323	321				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSO	LSO	LSO	LSO	LSO				
Day									
Outfall 101 - 10.98%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	24.6	24.0					
Final		24.7	25.0	25.0	24.7				
D.O. Initial	7.0	7.1	7.2	7.1					
Final		6.7	6.6	6.5	6.6				
pH Initial	8.1	8.1	8.1	8.1					
Final		7.8	7.9	7.4	7.2				
Conductivity	311	297	304	302					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSO	LSO	LSO	LSO	LSO				
Day									
Outfall 101 - 22%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	25.0	24.0					
Final		24.6	24.6	25.8	24.9				
D.O. Initial	6.6	7.2	7.2	7.2					
Final		6.7	6.6	6.6	6.5				
pH Initial	8.1	8.1	8.1	8.1					
Final		7.7	7.8	7.4	7.2				
Conductivity	296	291	291	287					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSO	LSO	LSO	LSO	LSO				

* change D.O. membrane * DSG

* terminated due to lack of sample day 4
 (BAD)

Client: TVA - Sequoyah Nuclear PlantAnalysts: VCS, BAD, DSGLocation: Soddy Daisy, TNDates/times: 11/27/01/1130 - 12/04/01/Test Type: Fathead Minnow 7-day Chronic

Day									
Outfall 101 - 43.9%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.2	24.6	24.0					
Final		24.6	24.2	25.0	25.6				
D.O. Initial	5.7	7.1	7.2	7.2					
Final		6.8	6.7	6.4	6.2				
pH Initial	8.0	8.0	8.0	8.0					
Final		7.6	7.6	7.3	7.3				
Conductivity	266	262	260	260					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSO	LSO	LSO	LSO	LSO				
Day									
Outfall 101 - 72%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	24.6	25.0					
Final		24.6	25.0	25.0	25.1				
D.O. Initial	5.7	7.2	7.2	7.2					Day 0 conductivity ⇒ 229
Final		6.7	6.5	6.4	6.3				
pH Initial	7.7	7.8	7.9	8.0					
Final		7.6	7.7	7.3	7.3				
Conductivity	533	217	230	225					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSO	LSO	LSO	LSO	LSO				
Day									
Outfall 101 - 100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.7	24.0	24.0	24.0					
Final		25.0	25.0	25.6	24.9				
D.O. Initial	5.4	7.1	7.2	7.2					
Final		6.8	6.7	6.4	6.5				
pH Initial	7.8	7.9	7.9	7.9					
Final		7.6	7.7	7.4	7.3				
Alkalinity	62	—	60	—					
Hardness	70	—	80	—					
Conductivity	140	184	146	182					
Chlorine	2.04	—	0.05	—					
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	LSO	LSO	LSO	LSO	LSO				

Sample Date: 11/27 11/27

DSG changed D.O. membrane day # 7

Client: TVA - Sequoyah Nuclear Plant

Location: Soddy Daisy, Tennessee

Test Type: Fathead Minnow 7-day Chronic

Analysts: VCS, B&D, DSL

Dates/times: 11/27/01 7:11:30 - 12/04/01

Day									
Intake - 100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.0	24.0	24.0	24.0					
Final		24.6	25.0	25.0	24.7				
D.O. Initial	5.0	7.1	7.0	7.1					
Final		6.5	6.4	6.3	6.7				
pH Initial	7.8	7.8	7.8	7.7					
Final		7.7	7.7	7.4	7.4				
Alkalinity	123	/	/	/					11/29 alk = 124 hard = 78
Hardness	88	/	/	/					
Conductivity	191	190	189	189					
Chlorine	0.05	/	0.02	/					
Initials	DSL	DSL	DSL	DSL	B&D				
QA Initials	LSO	LSO	LSO	LSO	LSO				
Sample Date:	11/27	11/28	11/29	11/30	12/1				

Sample Date: 11/27 11/27 11/29 11/29 12/1

DSL changed D.O. sometime day 1

CERIODAPHNIA TEST INFORMATION SHEET

Test Name: TVA - Sequoyah Nuclear Plant

Test Conducted From: 11/27/01 (Day 0) To 12/04/01 (Day 7)

Sites/Concentrations: 1. control 4. 43.9-1. Intake pool.
2. 10.987. 5. 727.
3. 221. 6. 1004.

Stock (if applicable): _____

Control Water Type (✓):

20% Dilute Mineral Water + Trace Minerals



Other (describe): _____



Dilution Water Type (✓):

20% Dilute Mineral Water + Trace Minerals



Other (describe): _____



Source of Test Organisms: S&ME brood board nos. 168

Age of Test Organisms:

Isolated neonates for test on 11/27/01 (date) from 0800 to 1300 (time) Initials VCS

Record of Minor Test Non-Conformity

Date: _____

Description of Non-Conformity: _____

Initials: _____

Date: _____

Description of Non-Conformity: _____

Initials: _____

Test Log sheets QA Reviewed By: _____ (Reviewer Initials) on _____ (Date)

Test Name: TVA-Sequoyah Nuclear Plant	Test Dates: 11/27/01-12/04/01
--	--------------------------------------

Test Dates: 11/27/01-12/04/01

[illegible]

Raw Data Sheet

Analysts: VCS. BFD. DSG

Test Start-Date/Time: 11/27/01/1300

Test Stop-Date/Time: 12/04/01

Replicate													Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9	10				
Control DMW 25%	DS	1	0										0	10	10	0
	DS	2	0										0	10	10	0
	DS	3	0					4					4	10	10	0.4
	BA	4	4	5	5	6	0	0	3	0	X	5		9	10	
		5														
		6														
		7														
												↓				
												↓				
		Total											0			

[illegible]

* lost animal

[illegible]

Ceriodaphnia 3-Brood Survival and Reproduction

Client: Tennessee Valley Authority-Sequoyah

Location: Soddy Daisy, Tennessee

Dates Samples Collected: 11/26, 11/28

Analysts: VCS, BAD, DSG

Test Start-Date/Time: 11/27/01 / 1300

Test Stop-Date/Time: 12/04/01

Replicate												Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult		
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9					10	
43.9% Outfall			-	-	-	-	-	-	-	-	-	-					
	0.5	1	0											0	10	10	0
	0.6	2	0					*						0	9	10	0
	0.5	3	0											0	9	10	0
	0.4	4	4	5	4	3	3		5	4	0	3			9	10	
		5															
		6															
		7															
									↓								
		Total							0								

* dropped animal

* dropped animal.

Replicate													Number of Young	# of Live Adults	# of Original Adults	Number of Young per Adult
Conc.	Init.	Day	1	2	3	4	5	6	7	8	9	10				
72% Outfall			--	--	--	--	--	--	--	--	--	--				
	D-5	1	0										0	10	10	0
	D-5	2	0										0	10	10	0
	D-5	3	0										0	10	10	0
	B-40	4	4	3	5	4	6	0	5	4	4	3				
		5														
		6														
		7														

[illegible]

Ceriodaphnia 3-Brood Survival and Reproduction

Raw Data Sheet

Client: Tennessee Valley Authority-Sequoyah

Location: Soddy Daisy, Tennessee

Dates Samples Collected: 11/26, 11/28

Analysts: VCS, BAD, DSG

Test Start-Date/Time: 11/27/01 / 1300

Test Stop-Date/Time: 12/04/01/

[illegible]

Client: TVA - Sequoyah Nuclear PlantLocation: Soddy Daisy, TNTemplate No.: 1Test Type: Ceriodaphnia 7-day ChronicAnalysts: VCS, BAD, DSCDates/times: 11/27/01/1300 - 12/04/01Age of Neonates < 24 hrs

Page 1

Day *									
Control: 20% DMW	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.0	24.0	24.0	25.1				conductivity day 1 ⇒ 179
Final		24.0	25.3	24.0	25.0				
D.O. Initial	7.2	7.2	7.2	7.1	7.3				conductivity day 2 ⇒ 177
Final		7.1	6.9	6.9	7.4				
pH Initial	8.1	8.1	8.1	8.1	8.1				
Final		8.1	8.4	8.2	8.2				
Alkalinity	68	/	/	/	68				
Hardness	88	/	/	/	88				
Conductivity	177	174	177	175	180				
Initials	DSC	DSC	DSC	DSC	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				
Day									
Outfall 101 - 10.98%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	24.2	24.0	/				conductivity day 1 ⇒ 178 184
Final		24.6	25.0	25.0	25.1				
D.O. Initial	7.3	7.2	7.1	7.1	/				conductivity day 2 ⇒ 170
Final		7.0	6.4	6.4	7.3				
pH Initial	8.2	8.2	8.2	8.1	/				
Final		8.1	8.4	8.2	8.2				
Conductivity	182	184	170	175	/				
Initials	DSC	DSC	DSC	DSC	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				
Day									
Outfall 101 - 22%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.0	24.0	25.1	24.0	/				cond
Final		24.2	24.0	25.0	25.1				
D.O. Initial	7.3	7.2	7.1	7.1	/				
Final		7.0	6.4	6.4	7.2				
pH Initial	8.1	8.1	8.1	8.1	/				
Final		8.1	8.4	8.3	8.3				
Conductivity	182	181	178	178	/				
Initials	DSC	DSC	DSC	DSC	BAD				
QA Initials	LSD	LSD	LSD	LSD	LSD				

* terminated test early due to lack of sample.
 (B&D)

Client: TVA - Sequoyah Nuclear PlantAnalysts: VCS, DSG, BADLocation: Soddy Daisy, TNDates/times: 11/27/01 / 1300 - 12/04/01Template No.: 1Age of Neonates < 24 hrsTest Type: Ceriodaphnia 7-day Chronic

Day									
Outfall 101 - 43.9%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.5	24.6	24.8	24.5	/				
Final		24.6	25.0	24.0	25.3				
D.O. Initial	7.2	7.2	7.1	7.1	/				
Final		7.1	6.9	6.8	7.0				
pH Initial	8.1	8.1	8.1	8.1	/				
Final		8.0	8.5	8.3	8.4				
Conductivity	184	185	182	182	/				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	USD	USD	USD	USD	USD				
Day									
Outfall 101 - 72%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.3	24.6	25.6	25.0	/				
Final		24.6	26.0	24.6	25.1				conductivity day 2 = 19.0
D.O. Initial	7.2	7.2	7.1	7.1	/				
Final		7.1	6.9	6.8	6.9				
pH Initial	8.0	8.1	8.1	8.1	/				
Final		8.0	8.4	8.4	8.4				
Conductivity	185	187	180	181	/				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	USD	USD	USD	USD	USD				
Day									
Outfall 101 - 100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	25.0	25.0	24.0	25.0	/				conductivity day 2 = 19.0
Final		25.0	25.0	24.0	25.3				
D.O. Initial	7.2	7.2	7.1	7.1	/				
Final		7.1	6.9	6.9	7.0				
pH Initial	7.9	7.4	8.2	7.4	/				
Final		7.8	8.6	8.4	8.5				
Alkalinity	62	/	66	/	/				
Hardness	70	/	80	/	/				
Conductivity	191	190	178	192	/				
Chlorine	0.04	/	0.05	/	/				
Initials	DSG	DSG	DSG	DSG	BAD				
QA Initials	USD	USD	USD	USD	USD				

Sample Date: 11/27 11/27 11/29 11/29

Client: TVA - Sequoyah Nuclear PlantLocation: Soddy Daisy, TennesseeTemplate No.: 1Test Type: Ceriodaphnia 7-day ChronicAnalysts: VCS, DSG, RADDates/times: 11/27/01 / 1300 - 12/4/01/Age of Neonates < 24 hrs

	Day								
Intake - 100%	0	1	2	3	4	5	6	7	Remarks
Temperature-Initial	24.0	24.0	24.0	24.0	/				
Final		24.6	25.0	25.6	25.3				
D.O. Initial	7.3	7.2	7.2	7.1	/				
Final		2.0	6.9	6.8	6.9				
pH Initial	7.8	7.8	7.9	7.7	/				
Final		7.7	8.5	8.3	8.2				
Alkalinity	63	/	64	/	/				
Hardness	88	/	78	/	/				
Conductivity	195	190	198	184	/				
Chlorine	0.05	/	0.02	/	/				
Initials	D46	D46	D56	D46	B40				
QA Initials									

Sample Date: 11/27 11/27 11/29 11/29 12/1