Results of Chronic Toxicity Tests Conducted on Selected A-Area Outfalls, June-August 1996

by

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Savannah River Site

Aiken, South Carolina 29808

MASTER

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WESTINGHOUSE SAVANNAH RIVER COMPANY

INTER-OFFICE MEMORANDUM

SRT-ESS-96-0443

October 03, 1996

TO: Mike Boerste, 773-43A

FROM: Winona L. Specht, 773-42A

Re: Final Report for A-Area Toxicity Tests

Attached is the final report which summarizes the results of the toxicity tests that were conducted on A-Area discharges, under Work Authorization Document LT960170.

cc: N. Turner, 773-43A
J.B. Gladden, 773-42A
J.L. Keyes, 742-A
D.V. Osteen, 742-A
W. Payne, 742-A
T. Smith, 742-A
L. Eldridge, 742-A
C.R. Whitehurst, 763-A
W. Wilmarth, 773-43A

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NUCLEAR INFORMATION

ADC &
Reviewing
Official: Donna Reddy

(Name and Title)

Date: LZ 6/11/97

RESULTS OF CHRONIC TOXICITY TESTS CONDUCTED ON SELECTED A-AREA OUTFALLS, JUNE-AUGUST 1996

by Winona L. Specht, ESS/SRTC

1.0 Introduction

In anticipation of possible toxicity testing requirements in the SRS's new (1996) NPDES permit, toxicity tests were performed at selected A-Area NPDES outfalls in order to determine if the outfalls were toxic. Chronic definitive toxicity tests were conducted on *Ceriodaphnia dubia* using water collected from nine locations (Table 1) during the summer of 1996.

Table 1. Sampling Locations for Toxicity Testing, June-August 1996.

Location	Source Inputs to Outfall
A-001A	Air Stripper
A-001B	Lab drains, neutralization facility
A-001C	Non-contact cooling water, steam condensate, storm water
A-003	Chilled water, steam condensate, cooling tower overflow, storm water
A-004	Steam condensate, storm water
A-005	Greenhouse water, A/C condensate, steam cleaning rack, lab drains, animal holding pen water, and storm water.
A-006	Overflow from animal holding ponds, storm water
AT-001	Combined discharge of A-001, A-003, A-004, and A-005
WE-001	Approximately 1 km downstream from AT-001; includes A-006

2.0 Methods

Definitive chronic toxicity tests were conducted on *Ceriodaphnia dubia* using EPA methods (Weber et al. 1989). Test conditions are specified in Table 2. Water collected from Upper Three Runs at Road 8-1 (Treadway Bridge) was used as control water and dilution water for the tests. Toxicity tests were performed on a series of dilutions, (0, 6.25%, 12.5%, 25%, 50% and 100% sample water), using 10 test organisms per concentration. At the end of the 7-day test the reproductive success (number of young produced) of organisms exposed to each dilution was compared statistically to that the control group (0%) in order to determine if reproduction was impaired.

The results of the tests were reported as NOEC's (No Observed Effect Concentration), which was the highest concentration tested that did not cause a significant reduction in reproduction. If there was no reproductive impairment, the NOEC was 100%. In addition, any mortality that occurred during the test was also recorded. If an outfall was found to be non-toxic, a second chronic definitive test was performed several weeks later to confirm that the outfall was consistently not toxic. Water quality parameters routinely measured during the toxicity tests include temperature, pH, hardness, alkalinity and specific conductance.

Table 2. Test Conditions for Conducting a 7-day Definitive Water Toxicity Test with *Ceriodaphnia dubia*

Parameter	Conditions
Test type	Static renewal
Temperature	25 ± 1°C
Light quality	Ambient laboratory illumination
Light intensity	50 - 100 foot candles
Photoperiod	16L:8D
Test chamber size	30 ml
Test solution volume	15 ml
Renewal of test water	Daily
Age of test organisms	Less than 24 h at start of test; all released within a 12 h period
# neonates/test chamber	1
# Neonates/concentration	10
Feeding regime	0.1 ml YCT and algal suspension/test chamber/day
Aeration	None
Dilution water	Upper Three Runs at Road 8-1
Number of dilutions	5 and a control
dilution factor	0.5
Test duration	Until at least 60% of control females have three broods (usually 7 days)
Test endpoints	Survival and reproduction
Test acceptability	80% or greater survival and an average of at least 15 young/surviving female in the control solutions
Sampling requirements	A minimum of three samples are collected for the seven day test (usually on days 1, 3, and 5 of the test). Samples are less than 72 hours old when used.

3.0 Results

The No Observed Effect Concentrations (NOEC's) for the toxicity tests are presented in Table 3. Copies of the toxicity testing reports can be found in the Appendix. Of the nine locations that were tested, three of the locations were not toxic (A-001A, A-006, and WE-001). The remaining six locations had NOEC's ranging from <6.25% to 50% effluent. The most toxic sampling locations were A-001C and A-003, which both exhibited reproductive impairment at the lowest effluent concentration that was tested (6.25%). All of the six locations that were chronically toxic were also acutely toxic when undiluted, producing 100% mortality in undiluted (100%) effluent (Table 3).

Table 3. No Observed Effect Concentrations (NOEC's) and Mortality for Toxicity Tests Performed on A-Area Outfalls, June-August 1996

Location	Test Date	NOEC	Percent Mortality in 100% Effluent
A-001A	7/16/96	100%	20%
A-001A (repeat)	8/6/96	100%	0%
A-001B	6/25/96	12.5%	100%
A-001C	6/25/96	<6.25%	100% ^a
A-003	6/25/96	<6.25%	100% ^b
A-004	7/9/96	25%	100%
A-005	7/9/96	50%	100%
A-006	7/9/96	100%	0%
A-006 (repeat)	7/23/96	100%	0%
AT-001	7/16/96	25%	100%
WE-001	7/16/96	100%	0%
WE-001 (repeat)	7/23/96	100%	0%

^a100% mortality in 25% effluent

^b100% mortality in 12.5% effluent

4.0 Summary/Conclusions/Path Forward

Chronic definitive toxicity tests were conducted at nine locations in the vicinity of A-Area. Six of the nine locations were toxic, with NOEC's ranging from <6.25% to 50%. Sampling location AT-001 which located downstream of outfalls A-001 (which includes A-001A, A-001B, and A-001C), A-003, A-004, and A-005 was toxic, with an NOEC of 25%. However, sampling location WE-001, which is located approximately 1 km downstream from AT-001, at the downstream end of a small wetland, was not toxic. Since there are no major tributaries flowing into Tim's Branch between these two sampling points, these results suggest that toxicants present at AT-001 are being removed by the wetland.

In order to determine why six of the sampling locations were toxic, Toxicity Identification Evaluations (TIE's) must be performed. TIE's were initiated in August 1996 at each of these six locations.

References

Weber, C.I, W.H. Peltier, T.J. Norberg-King, W.B. Horning II, F.A. Kessler, J.R. Menkedick, T.W. Neilheisel, P.A. Lewis, D.J. Klemm, Q.H. Pickering, E.L. Robinson, J.M. Lazorchak, L.J. Wymer, and R.W. Freyberg. 1989. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. EPA/600/4-89/001.

APPENDIX

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: A-001B

Date: 6/25/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Survival and Reproduction Results

Client: Westinghouse Savannah River Company
 Sample Identification: A-001B
 Test Date: 6/25/96 T5971

Reproduction at 0.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	9	0	0	12
2	1	2	0	10	10	23
3	0	3	10	0	9	22
4	3	6	7	0	11	27
5	3	4	4	0	13	24
6	0	6	0	15	0	21
7	3	7	10	0	0	20
8	0	4	0	5	0	9
9	2	6	9	0	0	17
10	3	0	0	2	13	18

Reproduction at 6.25% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	L	L	L	L	L
2	0	0	0	6	11	17
3	0	7	0	0	12	19
4	0	0	0	0	13	13
5	0	0	5	0	13	18
6	0	0	7	0	2	9
7	3	6	6	0	0	15
8	0	0	0	4	13	17
9	2	0	0	0	13	15
10	3	0	0	0	6	9

Reproduction at 12.5% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	4	3	0	8	0	15
2	0	0	0	10	10	20
3	0	0	0	0	0	0
4	4	0	0	8	13	25
5	3	2	0	0	12	17
6	3	0	4	7	0	14
7	4	0	1	0	9	14
8	0	1	0	0	12	13
9	3	0	2	0	10	15
10	4	0	0	0	7	11

Reproduction at 25.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	1	5	0	11	0	17
2	0	0	1	9	0	10
3	3	0	0	2	13	18
4	X	X	X	X	X	0
5	2	5	1	0	8	16
6	1	0	3	0	14	18
7	3	2	0	0	11	16
8	0	0	0	0	11	11
9	4	2	0	0	12	18
10	0	3	0	0	13	16

Reproduction at 50.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	3	X	X	X	X	3
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	0	5	X	X	X	5
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	0	X	X	X	X	0

Reproduction at 100% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	X	X	X	X	X	0

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Client: Westinghouse Savannah River Company
Sample Identification: A-001B
Test Date: 6/25/96

Test for Normality

Test Used: Shapiro Wilks	W=	0.906
	critical	0.93

The data are not normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test	B=	1.98
	critical	13.28

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: Wilcoxon's Test

t Test	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
t Value		2.04	2.22	2.40	8.39	N/A
critical		2.33	2.33	2.33	2.33	
mean	19.3	14.7	14.4	14.0	0.8	0.0
MSD=	5.14					

MSD= 5.14

Wilcoxon's Test	Test Concentration				
	6.25%	12.5%	25%	50.0%	100%
Rank Sum		84	76	N/A	N/A
critical		76	76		

LOEC= 25% effluent
NOEC= 12.5% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent was marginally non-toxic at 6.25 - 12.5% concentration and marginally toxic at 25% concentration.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: A-001B
 Test Date: 6/25/96 T5971

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Initial	7.86	7.40	7.36	7.40	7.49	7.81
Day 1	7.42	7.43	7.40	7.39	7.42	
Day 2	7.76	8.00	7.93	7.89	7.86	
Day 3	7.00	6.92	6.98	7.06	7.15	
Day 4		7.35	7.33	7.33	7.28	
Day 5		7.53	7.56	7.55	7.56	
Day 6		7.61	7.58	7.56		

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Day 1	7.18	7.29	7.33	7.38	7.31	7.38
Day 2	7.86	7.64	7.61	7.61	7.60	
Day 3	7.16	7.24	7.30	7.44	7.61	
Day 4		8.10	7.97	7.94	7.83	
Day 5		7.32	7.36	7.37	7.31	
Day 6		7.66	7.62	7.61		
Final						

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Initial	9.1	8.7	8.6	8.7	8.7	8.7
Day 1	9.1	8.4	8.5	8.5	8.5	
Day 2		8.8	8.8	8.7	8.7	
Day 3	8.8	8.8	8.8	8.7	8.7	
Day 4	8.8	8.7	8.8	8.8	8.9	
Day 5		8.7	8.7	8.7	8.7	
Day 6		8.6	8.6	8.6		

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Day 1		8.5	8.5	8.4	8.4	8.4
Day 2		8.4	8.4	8.4	8.4	
Day 3		8.3	8.3	8.4	8.4	
Day 4		8.4	8.6	8.4	8.4	
Day 5		8.5	8.6	8.6	8.6	
Day 6		8.5	8.5	8.5		
Final						

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.	
	mg/L	mg/L	mg/L	µmhos	
Eff. Sample 1	<0.01	59.7	14	127.3	
Eff. Sample 2	<.01	49.4	20	125.3	
Eff. Sample 3	0.07	39.1	8	112.4	
Dilution Water		70	84	187.9	

Temperature

Incubator °C	
Initial	24.6
Day 1	24.6
Day 2	24.9
Day 3	24.1
Day 4	25.7
Day 5	24.7
Day 6	25.2
Final	24.6

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: T6097 (A-001A)

Date: 7-16-96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company

Sample Identification: T6097 (A-001A)

Test Date: 7-16-96

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	8	0	10	0	22
2	0	2	7	0	0	8	17
3	0	5	7	0	11	0	23
4	0	L	L	L	L	L	L
5	0	3	10	0	0	0	13
6	0	6	8	0	11	0	25
7	0	5	L	L	L	L	L
8	0	0	5	10	0	1	16
9	0	0	6	10	0	6	22
10	0	4	7	0	12	0	23

Reproduction at 6.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	2	0	L	L	L	L
2	0	4	0	0	0	0	4
3	0	3	4	0	5	6	18
4	0	0	7	13	0	0	20
5	0	4	4	0	0	L	L
6	0	2	5	0	7	9	23
7	0	5	8	0	6	0	19
8	0	5	5	0	0	6	16
9	0	5	8	13	0	0	26
10	0	0	6	0	0	0	6

Reproduction at 12.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	7	0	6	0	16
2	0	5	7	0	14	0	26
3	0	0	0	0	0	L	L
4	0	4	8	0	5	0	17
5	0	5	7	0	10	0	22
6	0	0	0	0	8	10	18
7	0	L	0	0	0	L	L
8	0	0	7	0	0	8	15
9	0	4	8	0	0	0	12
10	0	0	0	0	7	5	12

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	8	0	9	0	17
2	0	3	8	0	4	L	15
3	0	0	5	10	0	11	26
4	0	2	10	4	0	7	23
5	0	4	L	0	0	0	L
6	0	6	L	0	8	10	24
7	0	5	L	0	0	0	L
8	0	1	5	0	0	8	14
9	0	6	8	6	0	0	20
10	0	4	1	0	11	0	16

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	8	0	L	L	L
2	0	4	0	0	3	4	11
3	0	4	2	0	X	0	6
4	0	1	0	0	0	L	L
5	0	4	1	0	10	0	15
6	0	7	3	0	7	0	17
7	0	0	0	0	9	15	24
8	0	4	1	0	0	0	5
9	0	0	L	L	L	L	L
10	0	4	3	0	5	14	26

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	4	0	8	0	16
2	0	X	X	X	X	X	0
3	0	5	7	15	0	0	27
4	0	4	4	0	10	0	18
5	0	3	0	0	10	10	23
6	0	5	9	0	4	0	18
7	0	1	0	0	9	10	20
8	0	X	X	X	X	X	0
9	0	5	6	13	0	0	24
10	0	2	7	0	8	0	17

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company
 Sample Identification: T6097 (A-001A)
 Test Date: 7-16-96

Test for Normality

Test Used: Shapiro Wilks W= 0.970
 critical 0.93

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test B= 7.04
 critical 15.1

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test

Test Concentration

	Control	6.0%	12.0%	25.0%	50%	100%
t Value		1.07	0.85	0.22	1.50	1.19
critical		2.33	2.33	2.33	2.33	2.33
mean	20.1	16.5	17.3	19.4	14.9	16.3

MSD= 7.49

NOEC (Survival): 100% conc.
 NOEC (Reproduction): 100% conc.

Effluent Conc. vs. Reproduction

Summary

The effluent is not toxic.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Water Chemistry**

Client: Westinghouse Savannah River Company
Sample Identification: T6097 (A-001A)
Test Date: 7-16-96

pH (After Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Initial	7.97	7.50				7.07
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						

pH (Before Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Day 1	8.18	7.24				7.22
Day 2	8.09	7.83				7.53
Day 3	8.24	7.75				7.36
Day 4	8.19	7.34				7.05
Day 5	7.98	7.34				7.05
Day 6	8.17	8.15				7.51
Final	8.19	7.55				7.12

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Initial	8.6	8.6				8.8
Day 1	8.5					
Day 2	8.6					
Day 3	8.7					
Day 4	8.6					
Day 5	8.6					
Day 6	8.7					

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Day 1	8.2	8.4				8.3
Day 2	8.5	8.4				8.5
Day 3	8.5	8.3				8.2
Day 4	8.6	8.1				8.2
Day 5	8.5	7.9				8.2
Day 6	8.6	7.9				8.0
Final	8.6	8.3				8.3

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	0.17	2.1	6.0	32.9		
Eff. Sample 2	0.04	2.1	6.0	33.8		
Eff. Sample 3	N/A	2.1	10.0	33.8		
Dilution Water		2.1	4.0	30		

Temperature

Incubator °C	
Initial	24.2
Day 1	24.3
Day 2	24.3
Day 3	24.4
Day 4	25.1
Day 5	25.9
Day 6	24.5
Final	24.4

Dilution Water was Upper Three Runs Creek Water pH Adjusted to 6.5

P.O. Box 16414, Greenville, SC 29606

(864) 877-6942 • FAX (864) 877-6938

4 Craftsman Court, Greer, SC 29650

7 Day Chronic Definitive Survival and Reproduction Bioassay

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: Outfall A-001A

Date: 8/06/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: Outfall A-001A
Test Date: 8/06/96 T6220

Reproduction at 0.0% Concentration						
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Total
1	0	4	9	10	0	23
2	0	4	8	0	15	27
3	3	6	9	0	0	18
4	4	3	8	13	0	28
5	0	4	10	9	0	23
6	0	3	9	0	12	24
7	0	4	4	0	10	18
8	0	4	10	14	0	28
9	4	4	9	0	0	17
10	0	7	8	0	11	26

Reproduction at 6.25% Concentration						
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Total
1	0	4	4	13	0	21
2	0	5	1	14	0	20
3	4	0	8	12	0	24
4	4	0	6	10	0	20
5	0	0	4	0	11	15
6	0	0	6	0	10	16
7	0	3	11	10	0	24
8	0	4	7	13	0	24
9	4	0	8	14	0	26
10	0	4	7	12	0	23

Reproduction at 12.5% Concentration						
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Total
1	0	3	8	14	0	25
2	0	1	7	9	0	17
3	3	0	8	13	0	24
4	4	0	9	15	0	28
5	0	4	9	3	12	28
6	0	4	6	0	16	26
7	0	0	10	5	8	23
8	0	0	10	14	0	24
9	4	0	8	14	0	26
10	0	4	7	0	8	19

Reproduction at 25.0% Concentration						
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Total
1	0	4	7	0	11	22
2	0	4	1	12	0	17
3	2	0	8	12	0	22
4	4	0	12	13	0	29
5	0	0	8	0	12	20
6	0	0	4	9	0	13
7	0	0	7	0	7	14
8	0	4	8	8	0	20
9	4	0	4	14	0	22
10	0	4	10	11	0	25

Reproduction at 50.0% Concentration						
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	6	0	9	15
2	0	0	6	13	0	19
3	4	0	9	15	0	28
4	4	0	6	12	0	22
5	0	3	13	16	0	32
6	0	0	7	0	15	22
7	0	0	11	4	0	15
8	0	1	4	11	0	16
9	4	0	4	14	0	22
10	0	0	5	13	0	18

Reproduction at 100.0% Concentration						
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Total
1	0	3	7	17	0	27
2	L	L	L	L	L	L
3	4	0	8	6	0	18
4	0	4	4	6	1	15
5	0	4	9	14	0	27
6	4	0	6	0	11	21
7	0	4	9	0	13	26
8	0	4	11	12	0	27
9	L	L	L	L	L	L
10	0	4	7	0	14	25

X = Dead
L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Client: Westinghouse Savannah River Company
Sample Identification: Outfall A-001A
Test Date: 8/06/96

Test for Normality

Test Used: Shapiro Wilks	W=	0.944
	critical	0.93

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test	B=	2.89
	critical	15.1

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
t Value		0.96	-0.40	1.41	1.16	-0.02
critical		2.33	2.33	2.33	2.33	
mean	23.2	21.3	24	20.4	20.9	23.25
MSD=	4.62					

NOEC (Survival): 100% effluent

NOEC (Reproduction): 100% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent is not chronically toxic.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: Outfall A-001A
 Test Date: 8/06/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Initial	6.50					
Day 1	6.50					
Day 2	6.50					
Day 3	6.50					
Day 4	6.50					
Day 5	6.50					
Day 6	6.50					

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Day 1		8.04				
Day 2		7.40				6.23
Day 3		7.76				7.68
Day 4		7.70				7.71
Day 5		7.57				8.03
Day 6		7.05				6.91
Final		6.65				6.62

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Initial	8.7					
Day 1	8.7					
Day 2	8.7					
Day 3	8.7					
Day 4	8.7					
Day 5	8.7					
Day 6	8.7					

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Day 1	8.4	8.6				
Day 2	8.5	8.2				8.3
Day 3	8.4	8.5				8.5
Day 4	8.3	8.4				8.4
Day 5	8.7	8.4				8.5
Day 6	8.8	8.6				8.7
Final	8.7	8.7				8.7

Dilution Water & Effluent Parameters

	Res Cl.	Alkalinity	Hard.	Cond.	
	mg/L	mg/L	mg/L	µmhos	
Eff. Sample 1	0.07	4.2	4	33.9	
Eff. Sample 2	0.06	2.1	10	79.2	
Eff. Sample 3	N/A	2.1	6	33.2	
Dilution Water		4	4	15	

Temperature

Incubator °C	
Initial	26.0
Day 1	24.3
Day 2	24.6
Day 3	24.6
Day 4	26.0
Day 5	25.0
Day 6	25.0
Final	25.2

Dilution water pH
 adjusted daily to pH 6.5

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company

Sample ID: A-001C

Date: 6/25/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: A-001C
Test Date: 6/25/96

Reproduction at 0.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	9	0	0	12
2	1	2	0	10	10	23
3	0	3	10	0	9	22
4	3	6	7	0	11	27
5	3	4	4	0	13	24
6	0	6	0	15	0	21
7	3	7	10	0	0	20
8	0	4	0	5	0	9
9	2	6	9	0	0	17
10	3	0	0	2	13	18

Reproduction at 6.25% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	1	5	8	14
2	0	0	1	0	0	1
3	0	0	0	0	4	4
4	0	0	0	3	8	11
5	0	0	0	0	1	1
6	0	0	0	4	0	4
7	0	0	1	2	11	14
8	0	0	3	11	0	14
9	0	0	0	0	13	13
10	0	0	2	2	4	8

Reproduction at 12.5% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	0	X	X	0
2	0	3	0	8	5	16
3	0	3	1	5	0	9
4	0	0	0	12	0	12
5	0	0	7	0	10	17
6	0	0	0	13	0	13
7	0	0	5	2	0	7
8	X	X	X	X	X	0
9	0	0	0	14	0	14
10	0	0	0	3	0	3

Reproduction at 25.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	X	X	X	X	X	0

Reproduction at 50.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	X	X	X	X	X	0

Reproduction at 100% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	X	X	X	X	X	0

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company
Sample Identification: A-001C
Test Date: 6/25/96

Test for Normality

Test Used: Shapiro Wilks	W=	0.886
	critical	0.93

The data are not normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test	B=	0.27
	critical	13.28

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: Wilcoxon's Test

t Test		Test Concentration				
		Control	6.25%	12.5%	25%	50.0%
t Value		5.43	5.08	N/A	N/A	N/A
critical		2.33	2.33	N/A	N/A	N/A
mean	19.3	8.4	9.1	0.0	0.0	0.0

MSD= 4.68

Wilcoxon's Test	Test Concentration				
	6.25%	12.5%	25%	50.0%	100%
Rank Sum	61				
critical	78				

LOEC= < 6.25% effluent

NOEC=< 6.25% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent was toxic at all test concentrations (lowest concentration run was 6.25%).

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: A-001C
 Test Date: 6/25/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Initial	8.28	7.89	7.67	7.63	7.59	7.56
Day 1	8.22	7.71	7.60			
Day 2	7.91	7.40	7.50			
Day 3	7.90	7.36	7.39			
Day 4	8.07	7.28	7.31			
Day 5	8.16	7.32	7.27			
Day 6	8.27	7.74	7.70			

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Day 1	8.20	7.05	7.11	7.19	7.23	7.27
Day 2	8.17	7.56	7.84			
Day 3	8.36	7.84	7.93			
Day 4	8.22	8.23	7.99			
Day 5	8.20	7.39	7.45			
Day 6	8.24	7.77	7.73			
Final	8.19	8.18	8.20			

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Initial	8.6	8.9	8.9	8.7	8.6	8.6
Day 1	8.7	8.8	8.9	8.9	8.6	8.6
Day 2	8.5	8.6	8.8			
Day 3	8.6	8.6	8.7			
Day 4	8.6	8.8	8.4			
Day 5	8.6	8.7	8.7			
Day 6	8.5	8.5	8.6			

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Day 1	8.6	8.7	8.7	8.6	8.5	8.3
Day 2	8.6	8.4	8.6		8.5	8.3
Day 3	8.4	8.4	8.3			
Day 4	8.4	8.6	8.5			
Day 5	8.6	8.6	8.6			
Day 6	8.5	8.6	8.6			
Final	8.5	8.0	8.0			

Dilution Water & Effluent Parameters

	Res Cl.	Alkalinity	Hard.	Cond.	
	mg/L	mg/L	mg/L	µmhos	
Eff. Sample 1	<.01	45.3	24	91.8	
Eff. Sample 2	<.01	49.4	14	1072	
Eff. Sample 3	0.3	41.2	8	929	
Dilution Water		70	84	187.9	

Temperature

Incubator °C	
Initial	24.6
Day 1	24.6
Day 2	24.9
Day 3	24.1
Day 4	25.7
Day 5	24.7
Day 6	25.2
Final	24.6

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company

Sample ID: A-003 Effluent

Date: 6/25/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Survival and Reproduction Results

Client: Westinghouse Savannah River Company
 Sample Identification: A-003 T5970
 Test Date: 6/25/96

Reproduction at 0.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	9	0	0	12
2	1	2	0	10	10	23
3	0	3	10	0	9	22
4	3	6	7	0	11	27
5	3	4	4	0	13	24
6	0	6	0	15	0	21
7	3	7	10	0	0	20
8	0	4	0	5	0	9
9	2	6	9	0	0	17
10	3	0	0	2	13	18

Reproduction at 6.2% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	0	1	2	0	5	8
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	0	3	5	0	14	22
7	0	3	4	0	12	19
8	X	X	X	X	X	0
9	4	6	12	0	0	22
10	3	0	0	9	7	19

Reproduction at 12.5% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	0	0	0	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	0	0	0	0	X	0

Reproduction at 25.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	X	X	X	X	X	0
10	X	X	X	X	X	0

Reproduction at 50.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	0
2	X	X	X	X	X	0
3	X	X	X	X	X	0
4	X	X	X	X	X	0
5	X	X	X	X	X	0
6	X	X	X	X	X	0
7	X	X	X	X	X	0
8	X	X	X	X	X	0
9	x	x	x	X	x	0
10	X	X	X	X	X	0

Reproduction at 100.0% Concentration						
Rep.	Day 3/4	Day 5	Day 6	Day 7	Day 8	Total
1		x	x	x	x	0
2		x	x	x	x	0
3		x	x	x	x	0
4		x	x	x	x	0
5		x	x	x	x	0
6		x	x	x	x	0
7		x	x	x	x	0
8		x	x	x	x	0
9		x	x	x	x	0
10		x	x	x	x	0

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinhouse Savannah River Company
 Sample Identification: A-003 T5970
 Test Date: 6/25/96

Test for Normality

Test Used: Shapiro Wilks W= 0.848
 critical 0.9

The data are not normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test B= 3.22
 critical 9.21

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: Wilcoxon's Test

t Test		Test Concentration				
	Control	6.2%	12.5%	25%	50%	100%
t Value		2.56	N/A	N/A	N/A	N/A
critical		2.33	2.33	2.33	2.33	
mean	19.3	9.0	0.0	0.0	0.0	0.0
MSD=	9.38					

Wilcoxon's Test		Test Concentration				
		0.062	0.125	0.25	0.5	1
Rank Sum	76	N/A	N/A	N/A	N/A	N/A
critical	82					

NOEC (Reproduction) <6.25% effluent

LOEC (Reproduction) <6.25% effluent

Eff. Conc. vs. Reproduction

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: A-003
 Test Date: 6/25/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Initial	7.86	7.66	7.55	7.54	7.67	7.89
Day 1	7.42	7.34	7.25	7.23		
Day 2	7.76	7.84	7.76			
Day 3	7.00	7.22	7.16			
Day 4	7.60	7.47	7.50			
Day 5	8.01	7.70	7.63			
Day 6	7.90	7.85	8.14			

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Day 1	7.18	7.21	7.23	7.32	7.39	7.63
Day 2	7.86	7.12	7.94			
Day 3	7.16	7.24	7.29			
Day 4	8.35	8.25	8.31			
Day 5	7.67	7.41	7.44			
Day 6	8.06	7.97				
Final	7.89	7.83	8.14			

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Initial	9.1	8.8	8.8	8.6	8.6	8.6
Day 1	9.1	8.9	8.8			
Day 2	8.6	8.8	8.8			
Day 3	8.8	8.7	8.8			
Day 4	8.8	8.8	8.6			
Day 5	8.9	8.8	8.8			
Day 6	8.8	8.8				

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50.0%	100%
Day 1	8.8	8.6	8.5	8.5	8.4	8.4
Day 2	8.6	8.6	8.6			
Day 3	8.6	8.6	8.6			
Day 4	8.4	8.6	8.6			
Day 5	8.7	8.7	8.7			
Day 6	8.6	8.7				
Final		7.9	7.9			

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.	
	mg/L	mg/L	mg/L	µmhos	
Eff. Sample 1	0.05	43.3	10	1290	
Eff. Sample 2	0.5	47.4	14	135.4	
Eff. Sample 3	0.1	55.6	10	148.3	
Dilution Water		70	84	187.9	

Temperature

	Incubator °C
Initial	24.6
Day 1	24.6
Day 2	24.9
Day 3	24.1
Day 4	25.7
Day 5	24.7
Day 6	25.2
Final	24.6

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism:

Ceriodaphnia dubia

Facility: Westinghouse Savannah River Company

Sample ID: A-004

Date: 7-09-96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Survival and Reproduction Results

Client: Westinghouse Savannah River Company
 Sample Identification: A-004
 Test Date: 7-09-96

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	5	8	11	0	0	24
2	0	5	6	16	0	0	27
3	0	3	1	12	12	0	28
4	0	0	6	0	9	10	25
5	0	3	10	12	0	0	25
6	0	0	7	12	1	0	20
7	0	0	11	13	0	0	24
8	3	X	X	X	X	X	3
9	0	0	9	14	0	0	23
10	0	3	7	7	0	0	17

Reproduction at 6.25% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	3	7	0	13	0	0	23
2	0	3	5	11	0	0	19
3	2	9	0	0	12	0	23
4	0	1	3	8	0	3	15
5	0	1	9	10	0	0	20
6	X	X	X	X	X	X	0
7	0	3	3	0	0	10	16
8	0	0	6	11	5	0	22
9	0	2	9	12	0	0	23
10	0	0	0	8	0	9	17

Reproduction at 12.5% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	4	8	0	10	0	0	22
2	0	4	6	12	0	0	22
3	0	4	6	9	0	0	19
4	2	0	3	13	7	0	25
5	0	1	6	10	0	9	26
6	0	X	X	X	X	X	0
7	0	6	0	14	0	0	20
8	3	0	6	8	0	0	17
9	0	5	5	12	0	0	22
10	0	0	5	0	0	0	5

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	3	0	3	9	0	7	22
2	0	2	3	12	0	0	17
3	2	6	0	6	9	0	23
4	0	4	7	9	0	0	20
5	0	4	9	13	0	0	26
6	0	4	5	0	8	0	17
7	0	2	6	12	0	0	20
8	3	0	6	10	0	0	19
9	0	3	1	0	11	0	15
10	0	4	6	10	0	0	20

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	2	8	0	8	0	0	18
2	0	2	6	0	10	0	18
3	3	6	0	8	0	0	17
4	L	L	L	L	L	L	L
5	0	4	0	3	0	0	7
6	0	1	5	0	2	0	8
7	X	X	X	X	X	X	0
8	0	4	3	X	X	X	7
9	0	2	4	7	0	0	13
10	X	X	X	X	X	X	0

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	X	0
2	X	X	X	X	X	X	0
3	X	X	X	X	X	X	0
4	X	X	X	X	X	X	0
5	X	X	X	X	X	X	0
6	X	X	X	X	X	X	0
7	X	X	X	X	X	X	0
8	X	X	X	X	X	X	0
9	X	X	X	X	X	X	0
10	X	X	X	X	X	X	0

X = Dead
 L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company
Sample Identification: A-004
Test Date: 7-09-96

Test for Normality

Test Used: Shapiro Wilks	W=	0.863
	critical	0.93

The data are not normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test	B=	7.77
	critical	13.28

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: Wilcoxon's Test

t Test

t Test		Test Concentration					
		Control	6.25%	12.5%	25.0%	50%	100%
t Value		1.24	1.24	0.55	3.75	NA	
critical		2.33	2.33	2.33	2.33	2.33	
mean		21.6	17.8	17.8	19.9	9.78	NA

MSD=	7.15
------	------

Wilcoxon's Test

Wilcoxon's Test	Test Concentration				
	6.25%	12.5%	25.0%	50%	100%
Rank Sum		86	83	54.5	
critical		75	75	75	

NOEC (Reproduction): 25% effluent

LOEC (Reproduction): 50% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent is toxic at concentrations of 50% and higher.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Water Chemistry**

Client: Westinghouse Savannah River Company
Sample Identification: A-004
Test Date: 7-09-96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Initial	6.60	7.30				7.30
Day 1	6.57	7.94				7.94
Day 2	6.54	7.72				7.72
Day 3	7.05	8.21				8.21
Day 4	no data	8.37				8.37
Day 5	6.47	7.86				7.86
Day 6	6.58	8.21				8.21

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Day 1	7.29					
Day 2	8.01					
Day 3	7.92					
Day 4						
Day 5	8.15					
Day 6	8.07					
Final	8.12					

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Initial	7.9	8.2				7.8
Day 1	8.2	8.4				8.6
Day 2	8.5	8.1				8.4
Day 3	8.1	8.3				8.4
Day 4	no data	no data				no data
Day 5	8.6	8.5				8.4
Day 6	8.5	8.4				

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Day 1	8.1	8.3				8.1
Day 2	8.2	8.1				8.1
Day 3	8.3	8.2				8.0
Day 4	no data	8.4				8.3
Day 5	8.4	8.5				8.3
Day 6	8.4	8.5			8.6	
Final	8.5	8.5			8.6	

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	<.01	26.8	2.0	79.1		
Eff. Sample 2	.10	57.7	4.0	140		
Eff. Sample 3	.20	57.7	4.0	131		

Temperature

	Incubator °C
Initial	24.8
Day 1	24.0
Day 2	24.0
Day 3	25.1
Day 4	25.2
Day 5	24.0
Day 6	24.8
Final	24.3

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company

Sample ID: A-005

Date: 7/09/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: A-005
Test Date: 7/09/96

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	5	8	11	0	0	24
2	0	5	6	16	0	0	27
3	0	3	1	12	12	0	28
4	0	0	6	0	9	0	15
5	0	3	10	12	0	0	25
6	0	0	7	12	1	0	20
7	0	0	11	13	0	0	24
8	3	x	x	x	x	x	3
9	0	0	9	14	0	0	23
10	0	3	7	0	0	0	10

Reproduction at 6.25% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	3	0	0	0	0	5	8
2	5	0	0	8	9	0	22
3	5	0	8	13	0	0	26
4	4	8	0	8	0	0	20
5	3	x	x	x	x	x	3
6	2	4	0	11	0	2	19
7	0	3	2	0	5	5	15
8	0	0	1	0	7	7	15
9	0	2	9	12	0	0	23
10	5	8	0	15	0	0	28

Reproduction at 12.5% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	3	7	0	0	14
2	0	7	0	0	11	0	18
3	4	0	5	7	8	0	24
4	4	4	0	14	0	0	22
5	3	0	5	10	0	0	18
6	1	6	0	13	0	0	20
7	0	2	3	14	0	0	19
8	0	5	7	0	11	0	23
9	0	5	5	0	8	0	18
10	4	0	0	19	0	0	23

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	1	0	0	7	9	0	17
2	0	7	0	10	8	0	25
3	4	0	6	9	0	0	19
4	4	0	0	11	3	0	18
5	3	3	6	11	0	0	23
6	0	3	0	1	12	9	25
7	0	3	5	16	0	0	24
8	4	0	0	7	11	0	22
9	0	3	3	12	0	13	31
10	3	0	7	15	0	0	25

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	4	6	0	9	19
2	0	5	0	2	6	7	20
3	0	0	7	11	4	0	22
4	0	0	1	1	0	10	12
5	0	3	8	3	0	11	25
6	0	0	0	2	0	1	3
7	0	0	5	18	0	0	23
8	0	0	5	0	9	9	23
9	0	3	4	5	0	14	26
10	3	0	6	3	8	0	20

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	X	0
2	X	X	X	X	X	X	0
3	X	X	X	X	X	X	0
4	X	X	X	X	X	X	0
5	X	X	X	X	X	X	0
6	X	X	X	X	X	X	0
7	X	X	X	X	X	X	0
8	X	X	X	X	X	X	0
9	X	X	X	X	X	X	0
10	X	X	X	X	X	X	0

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company

Sample Identification: A-005

Test Date: 7/09/96

Test for Normality

Test Used: Shapiro Wilks W= 0.920
critical 0.93

The data are not normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test B= 10.80
critical 13.28

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: Wilcoxon's Test

t Test

Test Concentration

	Control	6.25%	12.5%	25%	50%	100%
t Value		0.70	0.00	-1.05	0.21	NA
critical		2.33	2.33	2.33	2.33	2.33
mean	19.9	17.9	19.9	22.9	19.3	0

MSD= 6.63

Wilcoxon's Test

Test Concentration

	6.25%	12.5%	25%	50%	100%
Rank Sum				96	NA
critical				75	NA

NOEC (Reproduction): 50% effluent

LOEC (Reproduction): 100% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent is toxic at 100% concentration but not at 50% concentration.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: A-005
 Test Date: 7/09/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Initial	6.60	7.24				7.72
Day 1	6.57	7.72				7.72
Day 2	6.54	7.58				7.72
Day 3	7.05	6.95				7.72
Day 4	no data	8.04				7.72
Day 5	6.47	8.11				7.72
Day 6	6.58	7.71			7.93	

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Day 1	7.29					
Day 2	8.01					
Day 3	7.92					
Day 4	no data					
Day 5	8.15					
Day 6	8.07					
Final	8.18					

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Initial	7.9	8.0				8.0
Day 1	8.2	7.6				8.0
Day 2	8.5	8.1				8.0
Day 3	8.1	8.0				8.0
Day 4	no data	no data				8.0
Day 5	8.6	8.4				8.0
Day 6	8.5	8.5				8.0

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Day 1	8.1	7.8				7.5
Day 2	8.2	8.2				7.5
Day 3	8.3	8.1				7.5
Day 4	no data	8.4				7.5
Day 5	8.4	8.3				7.5
Day 6	8.4	8.5				7.5
Final		8.2				7.5

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	0.16	35	4.0	95		
Eff. Sample 2	0.17	59.7	6.0	139		
Eff. Sample 3	0.05	51.5	4.0	108		
Dilution Water						

Temperature

	Incubator °C
Initial	24.8
Day 1	24.0
Day 2	24.0
Day 3	25.1
Day 4	25.2
Day 5	24.0
Day 6	24.8
Final	24.3

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: A-006

Date: 7/09/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Survival and Reproduction Results

Client: Westinghouse Savannah River Company
 Sample Identification: A-006
 Test Date: 7/09/96

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	0	11	0	4	15
2	3	0	2	8	12	0	25
3	0	1	5	5	0	3	14
4	0	4	8	12	0	0	24
5	3	0	8	10	0	0	21
6	2	0	2	7	10	0	21
7	0	0	7	0	0	0	7
8	0	0	6	0	14	0	20
9	2	0	2	10	8	0	22
10	0	0	6	10	8	0	24

Reproduction at 6.25% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	2	7	0	5	18
2	4	7	0	12	0	0	23
3	0	0	6	0	0	5	11
4	0	4	6	10	0	0	20
5	3	0	8	10	0	0	21
6	1	0	7	9	0	0	17
7	3	0	3	15	0	0	21
8	0	2	4	0	14	0	20
9	4	0	3	12	0	0	19
10	3	6	0	13	0	0	22

Reproduction at 12.5% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	6	12	9	0	27
2	2	9	0	10	0	0	21
3	0	2	7	12	0	0	21
4	0	4	6	12	0	0	22
5	2	0	8	11	0	0	21
6	0	0	6	9	0	4	19
7	0	0	4	8	5	0	17
8	0	6	0	7	14	0	27
9	0	0	6	10	0	0	16
10	1	0	9	13	0	0	23

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	7	5	0	0	15
2	5	5	0	9	0	0	19
3	0	0	3	9	8	0	20
4	0	5	3	11	0	0	19
5	0	4	6	2	0	10	22
6	2	6	0	8	8	0	24
7	3	0	7	5	5	0	20
8	0	2	3	0	10	14	29
9	2	6	0	10	0	0	18
10	2	9	0	14	0	0	25

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	2	8	13	0	0	23
2	0	4	0	12	12	0	28
3	0	4	5	14	0	0	23
4	0	5	2	11	0	0	18
5	0	0	8	11	0	0	19
6	0	8	0	14	0	0	22
7	0	0	2	15	13	0	30
8	0	4	3	X	X	0	7
9	3	0	7	13	0	0	23
10	1	8	0	9	0	0	18

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	9	11	0	0	24
2	1	5	0	10	13	0	29
3	0	2	7	8	6	0	23
4	3	0	8	0	17	0	28
5	2	0	2	6	0	3	13
6	0	0	5	3	6	5	19
7	0	0	7	0	0	9	16
8	0	1	7	0	16	0	24
9	3	0	3	3	0	4	13
10	1	8	0	13	0	0	22

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company
 Sample Identification: A-006
 Test Date: 7/09/96

Test for Normality

Test Used: Shapiro Wilks W= 0.961
 critical 0.93

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test B= 6.09
 critical 15.1

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test	Test Concentration						
	Control	6.25%	12.5%	25%	50%	100%	
t Value		0.05	-0.96	-0.82		-0.82	-0.82
critical		2.33	2.33	2.33		2.33	2.33
mean	19.3	19.2	21.4	21.1		21.1	21.1

MSD= 5.09

Wilcoxon's Test	Test Concentration					
	6.25%	12.5%	25%	50%	100%	
Rank Sum						
critical						

NOEC (Reproduction): 100% effluent

LOEC (Reproduction): >100% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent is not chronically toxic to the test organisms.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: A-006
 Test Date: 7/09/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Initial	6.60	7.97				8.38
Day 1	6.57	7.58				7.82
Day 2	6.54	7.95				7.96
Day 3	7.05	7.09				7.70
Day 4	no data	8.02				8.05
Day 5	6.47	8.23				8.17
Day 6	6.58	7.87				7.93

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Day 1	7.29					
Day 2	8.01					
Day 3	7.92					
Day 4	no data					
Day 5	8.15					
Day 6	8.07					
Final	8.18					

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Initial	7.9	7.8				8.0
Day 1	8.2	7.8				7.9
Day 2	8.5	8.1				
Day 3	8.1	8.0				
Day 4	no data	no data				
Day 5	8.6	8.4				
Day 6	8.5	8.5				

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25%	50%	100%
Day 1	8.1	8.2				8.4
Day 2	8.2	8.3				8.3
Day 3	8.3	8.2				8.3
Day 4	no data	8.3				8.4
Day 5	8.4	8.5				8.4
Day 6	8.4	8.3				8.3
Final		8.2				8.3

Dilution Water & Effluent Parameters

	Res Cl.	Alkalinity	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	0.02	18.5	4.0	84		
Eff. Sample 2	0.07	45.3	4.0	98		
Eff. Sample 3	0.04	45.3	8.0	96		

Temperature

	Incubator °C
Initial	24.8
Day 1	24.0
Day 2	24.0
Day 3	25.1
Day 4	25.2
Day 5	24.0
Day 6	24.8
Final	24.3

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7 Day Chronic Definitive Survival and Reproduction Bioassay

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: Outfall A-006

Date: 7/23/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: Outfall A-006
Test Date: 7/23/96 T6124

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	8	0	13	0	25
2	0	0	4	7	2	8	21
3	0	3	5	1	13	0	22
4	0	4	3	0	13	0	20
5	0	3	4	8	0	12	27
6	0	0	4	8	0	1	13
7	0	0	7	8	11	0	26
8	0	4	7	0	12	0	23
9	0	5	6	8	0	0	19
10	0	0	4	6	0	8	18

Reproduction at 6.25% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	7	8	0	14	29
2	0	1	3	6	1	11	22
3	0	0	8	0	13	0	21
4	0	0	2	9	1	8	20
5	0	4	8	5	1	0	18
6	0	0	4	5	0	9	18
7	0	3	6	9	11	0	29
8	0	5	5	0	13	0	23
9	0	2	7	2	0	14	25
10	0	0	0	2	6	5	13

Reproduction at 12.5% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	7	9	0	0	20
2	0	0	5	9	0	9	23
3	0	4	7	0	0	10	21
4	0	3	4	0	3	11	21
5	0	4	6	10	0	0	20
6	0	1	2	5	0	4	12
7	4	0	6	6	0	0	16
8	0	3	3	10	0	0	16
9	0	1	6	12	0	9	28
10	0	0	0	0	4	11	15

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	5	7	0	10	26
2	3	0	1	3	0	6	13
3	0	0	6	0	13	12	31
4	0	0	5	0	12	0	17
5	0	3	5	9	0	9	26
6	0	0	2	3	0	8	13
7	3	0	0	0	0	0	3
8	0	4	9	0	0	11	24
9	0	0	8	3	0	11	22
10	0	0	7	0	9	6	22

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	2	5	8	0	10	25
2	0	0	6	6	7	0	19
3	0	1	0	6	10	0	17
4	0	0	8	5	0	8	21
5	0	2	0	0	0	6	8
6	0	0	0	0	0	0	0
7	0	0	0	0	0	1	1
8	0	3	6	3	0	8	20
9	0	4	5	0	0	5	14
10	0	3	4	0	0	9	16

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	4	8	1	13	29
2	6	0	5	0	9	0	20
3	0	4	6	5	0	8	23
4	0	0	0	0	0	5	5
5	3	0	6	7	1	0	17
6	0	0	6	0	6	3	15
7	3	0	7	0	0	0	10
8	0	0	8	6	0	15	29
9	0	3	7	9	0	0	19
10	0	3	6	8	0	0	17

X = Dead
L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company
 Sample Identification: Outfall A-006
 Test Date: 7/23/96

Test for Normality

Test Used: Shapiro Wilks W= 0.958
 critical 0.93

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test B= 8.51
 critical 15.1

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test	Test Concentration					
	Control	6.25%	13%	25.0%	50%	100%
t Value		-0.14	0.75	0.58	2.50	1.03
critical		2.33	2.33	2.33	2.33	2.33
mean	21.4	21.8	19.2	19.7	14.1	18.4
MSD=	6.80					

NOEC (Survival): 100% effluent
 NOEC (Reproduction): 100% effluent

The mean reproduction at 50% effluent is considered anomalous, reflecting a few weak organisms.

Effluent Conc. vs. Reproduction

Summary

The effluent is not chronically toxic.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Water Chemistry**

Client: Westinghouse Savannah River Company
Sample Identification: Outfall A-006
Test Date: 7/23/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	13%	25.0%	50%	100%
Initial	6.52	7.63				7.43
Day 1	6.58	7.25				7.80
Day 2	6.55	6.82				7.95
Day 3	6.53	7.47				8.08
Day 4	6.50					
Day 5	6.57	6.25				7.97
Day 6	6.54	7.60				7.89

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	13%	25.0%	50%	100%
Day 1	7.25	6.82				7.81
Day 2	7.89	7.63				7.72
Day 3	7.71	7.36				7.99
Day 4						
Day 5	6.53	6.36				7.03
Day 6	7.88	7.72				7.82
Final	7.93	7.79				8.26

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	13%	25.0%	50%	100%
Initial	8.9	8.8				9.0
Day 1	8.1	8.1				8.2
Day 2	8.3	8.2				8.5
Day 3	8.3	8.2				8.4
Day 4						
Day 5	8.5	8.3				8.6
Day 6	8.4	8.3				8.4

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	13%	25.0%	50%	100%
Day 1	8.1	8.1				8.1
Day 2	8.2	8.4				8.2
Day 3	8.3	8.3				8.4
Day 4						
Day 5	8.4	8.3				8.4
Day 6	8.2	8.2				8.3
Final	8.3	8.1				8.2

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	0.03	41.2	6	95.7		
Eff. Sample 2	0.06	45.3	4	98.1		
Eff. Sample 3	0.05	48.3	8	101.2		
Dilution Water		4.1	4	15		

Temperature

Incubator °C	
Initial	25.5
Day 1	24.4
Day 2	24.3
Day 3	24.8
Day 4	24.5
Day 5	24.5
Day 6	25.3
Final	24.7

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: T6098 (AT-001)

Date: 7-16-96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: T6098 (AT-001)
Test Date: 7-16-96

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	8	0	10	0	22
2	0	2	7	0	0	8	17
3	0	5	7	0	11	0	23
4	0	L	L	L	L	L	L
5	0	3	10	0	0	0	13
6	0	6	8	0	11	0	25
7	L	L	L	L	L	L	L
8	0	0	5	10	0	1	16
9	0	0	6	10	0	6	22
10	0	4	7	0	12	0	23

Reproduction at 6.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	8	0	0	3	14
2	0	3	7	0	10	0	20
3	0	4	8	9	0	0	21
4	0	0	12	9	0	0	21
5	0	6	9	0	0	3	18
6	0	5	9	11	0	0	25
7	0	4	6	0	8	0	18
8	L	L	L	L	L	L	L
9	0	5	4	0	13	0	22
10	0	3	9	0	14	0	26

Reproduction at 12.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	0	8	0	0	1	9
2	0	0	4	L	L	L	L
3	0	0	7	4	5	5	21
4	4	0	8	9	0	0	21
5	0	4	7	0	12	0	23
6	0	5	8	0	0	0	13
7	0	5	9	0	3	12	29
8	0	5	7	0	9	0	21
9	0	0	8	11	0	0	19
10	0	4	7	0	11	0	22

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	2	6	0	13	0	21
2	0	0	3	5	9	0	17
3	0	0	8	0	8	0	16
4	0	3	7	10	0	0	20
5	0	5	9	0	13	0	27
6	L	L	L	L	L	L	L
7	0	4	9	0	8	0	21
8	0	3	7	0	10	0	20
9	0	5	7	11	0	0	23
10	0	2	5	0	12	0	19

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	X	0
2	X	X	X	X	X	X	0
3	X	X	X	X	X	X	0
4	X	X	X	X	X	X	0
5	X	X	X	X	X	X	0
6	X	X	X	X	X	X	0
7	X	X	X	X	X	X	0
8	X	X	X	X	X	X	0
9	X	X	X	X	X	X	0
10	X	X	X	X	X	X	0

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	X	X	X	X	X	X	0
2	X	X	X	X	X	X	0
3	X	X	X	X	X	X	0
4	X	X	X	X	X	X	0
5	X	X	X	X	X	X	0
6	X	X	X	X	X	X	0
7	X	X	X	X	X	X	0
8	X	X	X	X	X	X	0
9	X	X	X	X	X	X	0
10	X	X	X	X	X	X	0

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company

Sample Identification: T6098 (AT-001)

Test Date: 7-16-96

Test for Normality

Test Used: Shapiro Wilks	W=	0.971
	critical	0.919

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test	B=	3.06
	critical	13.28

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test

Test Concentration

	Control	6.0%	12.0%	25.0%	50%	100%	
t Value		-0.20	0.16	-0.15	NA	NA	
critical		2.33	2.33	2.33	2.33	2.33	
mean	20.1	20.6	19.8	20.4	0.0	0.0	
% mortality		0%	0%	0%	100%	100%	

NOEC (Survival): 25% effluent

NOEC (Reproduction): 25% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent is toxic at concentrations of 50% and higher.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Water Chemistry**

Client: Westinghouse Savannah River Company
Sample Identification: T6098 (AT-001)
Test Date: 7-16-96

pH (After Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Initial	7.97	7.80				7.74
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						

pH (Before Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Day 1	8.18	7.15				7.82
Day 2	8.09	8.17				7.83
Day 3	8.24	7.55				7.61
Day 4	8.19	7.32				7.61
Day 5	7.98	7.46		7.48		
Day 6	8.17	7.43		7.44		
Final	8.19	7.14		7.16		

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Initial	8.6	8.3				8.6
Day 1	8.5					
Day 2	8.6					
Day 3	8.7					
Day 4	8.6					
Day 5	8.6					
Day 6	8.7					

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Day 1	8.2	8.0				8.3
Day 2	8.5	8.1				8.1
Day 3	8.5	8.6				8.6
Day 4	8.6	8.4				8.4
Day 5	8.5	8.1		8.2		8.2
Day 6	8.6	8.3		8.3		
Final	8.6	8.3		8.2		

Dilution Water & Effluent Parameters

	Res Cl.	Alkalinity	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	0.02	28.8	6.0	80		
Eff. Sample 2	0.06	25.2	10.0	79		
Eff. Sample 3	N/A	29.4	6.0	86		
Dilution Water		2.1	4.0	30		

Temperature

	Incubator °C
Initial	24.2
Day 1	24.3
Day 2	24.3
Day 3	24.4
Day 4	25.1
Day 5	25.9
Day 6	24.5
Final	24.4

Dilution water was Upper Three Runs Creek water pH adjusted to 6.5.

**7 Day Chronic Definitive Survival
and Reproduction Bioassay**

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: T6099 (WE-001)

Date: 7-16-96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: T6099 (WE-001)
Test Date: 7-16-96

Reproduction at 0.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	8	0	10	0	22
2	0	2	7	0	0	8	17
3	0	5	7	0	11	0	23
4	0	L	L	L	L	L	L
5	0	3	10	0	0	0	13
6	0	6	8	0	11	0	25
7	0	5	L	L	L	L	L
8	0	0	5	10	0	1	16
9	0	0	6	10	0	6	22
10	0	4	7	0	12	0	23

Reproduction at 6.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	1	0	11	0	7	19
2	0	2	11	0	13	0	26
3	0	5	8	10	0	0	23
4	0	5	9	7	0	0	21
5	0	4	0	8	12	0	24
6	0	0	8	L	L	L	L
7	0	0	10	11	0	0	21
8	0	5	11	13	0	0	29
9	0	0	7	9	0	0	16
10	L	L	L	L	L	L	L

Reproduction at 12.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	6	0	12	0	21
2	0	5	8	0	13	0	26
3	0	0	4	11	8	0	23
4	0	7	13	8	0	0	28
5	0	L	L	L	L	L	L
6	0	5	9	0	15	0	29
7	0	4	8	0	13	0	25
8	0	4	7	13	0	0	24
9	0	5	8	10	0	0	23
10	0	0	L	L	L	L	L

Reproduction at 25.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	8	2	10	0	24
2	0	2	11	0	9	0	22
3	0	0	6	10	8	0	24
4	0	5	10	11	0	0	26
5	0	L	L	L	L	L	L
6	0	4	9	0	12	0	25
7	0	4	6	7	0	0	17
8	0	6	9	9	0	0	24
9	0	3	10	10	0	0	23
10	1	3	7	0	15	0	26

Reproduction at 50.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	3	10	11	0	0	24
2	0	1	9	13	0	0	23
3	0	3	6	12	0	0	21
4	0	5	11	11	0	0	27
5	0	2	12	0	16	0	30
6	0	4	6	11	0	0	21
7	0	3	9	13	0	0	25
8	0	0	10	0	14	0	24
9	0	5	10	8	0	0	23
10	0	4	6	0	5	0	15

Reproduction at 100.0% Concentration							
Rep.	Day 2/3	Day 4	Day 5	Day 6	Day 7	Day 8	Total
1	0	4	7	14	0	0	25
2	0	7	8	13	0	0	28
3	0	4	8	11	0	0	23
4	0	5	7	11	0	0	23
5	0	5	11	10	0	0	26
6	0	5	10	10	0	0	25
7	0	4	9	12	0	0	25
8	0	1	10	18	0	0	29
9	0	4	8	10	0	0	22
10	0	3	5	14	0	0	22

X = Dead
L = Lost or caught in surface tension of water

Statistical Analyses

Test Date: 7-16-96

Test for Normality

Test Used: Shapiro Wilks	W=	0.979
	critical	0.93

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test	B=	5.50
	critical	15.1

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test

Test Concentration

	Control	6.0%	12.0%	25.0%	50%	100%
t Value		-0.38	-0.80	-0.58	-0.57	-0.83
critical		2.33	2.33	2.33	2.33	2.33
mean	20.1	22.4	24.9	23.4	23.3	24.8
% mortality		0%	0%	0%	0%	0%

NOEC (Survival): 100% effluent
NOEC (Reproduction): 100% effluent

Effluent Conc. vs. Reproduction

Summary

The sample is not toxic.

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Water Chemistry

Client: Westinghouse Savannah River Company
 Sample Identification: T6099 (WE-001)
 Test Date: 7-16-96

pH (After Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Initial	7.97	7.80				7.74
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						

pH (Before Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Day 1	8.18	7.15				7.82
Day 2	8.09	8.17				7.83
Day 3	8.24	7.55				7.61
Day 4	8.19	7.32				7.61
Day 5	7.98	7.46		7.48		
Day 6	8.17	7.43		7.44		
Final	8.19	7.14		7.16		

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Initial	8.6	8.3				8.3
Day 1	8.5					
Day 2	8.6					
Day 3	8.7					
Day 4	8.6					
Day 5	8.6					
Day 6	8.7					

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.0%	12.0%	25.0%	50%	100%
Day 1	8.2	7.9				7.9
Day 2	8.5	8.4				8.3
Day 3	8.5	8.4				8.5
Day 4	8.6					
Day 5	8.5	8.0				8.1
Day 6	8.6	8.1				8.3
Final	8.6	8.5				8.1

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.		
	mg/L	mg/L	mg/L	µmhos		
Eff. Sample 1	0.02	18.5	6.0	63		
Eff. Sample 2	0.06	14.4	4.0	46		
Eff. Sample 3	N/A	8.4	24.0	30		
Dilution Water		2.1	4.0	30		

Temperature

	Incubator °C
Initial	24.2
Day 1	24.3
Day 2	24.3
Day 3	24.4
Day 4	25.1
Day 5	25.9
Day 6	24.5
Final	24.4

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7 Day Chronic Definitive Survival and Reproduction Bioassay

Method: EPA/600/4-89/001

Test Organism: *Ceriodaphnia dubia*

Facility: Westinghouse Savannah River Company
Sample ID: Outfall WE-001

Date: 7/23/96

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Survival and Reproduction Results**

Client: Westinghouse Savannah River Company
Sample Identification: Outfall WE-001
Test Date: 7/23/96 T6184

Reproduction at 0.0% Concentration							
Rep.	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	0	0	7	12	19
2	0	0	4	6	0	8	18
3	0	2	0	6	7	5	20
4	0	0	0	7	10	13	30
5	0	0	4	4	12	0	20
6	0	0	3	8	0	14	25
7	0	0	4	8	6	0	18
8	0	0	3	7	0	12	22
9	0	0	4	7	9	0	20
10	0	0	0	8	11	10	29

Reproduction at 6.25% Concentration							
Rep.	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	4	0	9	12	25
2	0	0	4	6	10	0	20
3	0	3	0	4	9	0	16
4	0	0	3	6	8	0	17
5	0	0	0	5	12	4	21
6	0	0	4	6	0	15	25
7	0	4	9	13	0	0	26
8	0	2	0	0	13	16	31
9	0	0	0	10	10	7	27
10	0	0	3	8	0	15	26

Reproduction at 12.5% Concentration							
Rep.	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	0	0	7	10	17
2	0	0	3	10	11	0	24
3	0	2	0	7	13	0	22
4	0	0	3	4	7	7	21
5	0	0	0	7	10	10	27
6	0	0	5	7	0	9	21
7	0	0	4	12	12	0	28
8	0	0	4	0	16	15	35
9	0	0	4	0	0	13	17
10	0	2	0	8	6	0	16

Reproduction at 25.0% Concentration							
Rep.	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	0	0	0	15	15
2	0	0	4	7	2	0	13
3	0	3	7	0	14	0	24
4	0	3	0	10	15	0	28
5	0	0	4	8	5	5	22
6	0	0	4	5	13	0	22
7	0	5	0	3	12	0	20
8	0	0	3	2	0	10	15
9	0	0	4	0	13	10	27
10	0	2	0	6	10	0	18

Reproduction at 50.0% Concentration							
Rep.	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	0	8	0	18	26
2	0	0	5	14	10	0	29
3	0	3	5	0	12	0	20
4	0	0	0	8	13	4	25
5	0	0	5	7	2	10	24
6	0	0	5	8	0	12	25
7	0	5	0	13	2	0	20
8	0	0	4	7	0	17	28
9	0	0	5	11	0	11	27
10	0	0	4	7	0	16	27

Reproduction at 100.0% Concentration							
Rep.	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Total
1	0	0	4	12	0	16	32
2	0	0	4	10	14	0	28
3	0	1	0	6	11	0	18
4	0	0	0	10	8	13	31
5	0	0	0	1	10	12	23
6	0	0	3	8	0	14	25
7	0	0	5	11	17	0	33
8	0	3	4	0	11	0	18
9	0	0	3	12	15	0	30
10	0	0	4	3	0	12	19

X = Dead

L = Lost or caught in surface tension of water

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST

Statistical Analyses

Client: Westinghouse Savannah River Company
 Sample Identification: Outfall WE-001
 Test Date: 7/23/96

Test for Normality

Test Used: Shapiro Wilks W= 0.933
 critical 0.93

The data are normal in distribution

Test for Homogeneity of Variance

Test Used: Bartlett's Test B= 4.62
 critical 15.1

The data are homogeneous in variance

Test for Differences in Reproduction

Test Type Used: t Test

t Test	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
t Value		-0.59	-0.32	0.77	-1.36	-1.64
critical		2.33	2.33	2.33	2.33	2.33
mean	22.1	23.4	22.8	20.4	25.1	25.7
MSD=	5.13					

NOEC (Survival): 100% effluent

NOEC (Reproduction): 100% effluent

Effluent Conc. vs. Reproduction

Summary

The effluent is not toxic

CHRONIC DEFINITIVE SURVIVAL AND REPRODUCTION TEST **Water Chemistry**

Client: Westinghouse Savannah River Company
 Sample Identification: Outfall WE-001
 Test Date: 7/23/96

pH (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Initial	6.51					
Day 1	6.52					
Day 2	6.51					
Day 3	6.47					
Day 4	6.53					
Day 5	6.59					
Day 6	6.49					

pH (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Day 1	7.69	7.25				7.64
Day 2	8.13	9.97				7.83
Day 3	7.79	7.58				7.65
Day 4	7.96	7.67				8.03
Day 5	7.63	7.49				7.56
Day 6	7.88	7.63				7.64
Final	7.93	7.67				7.89

Dissolved Oxygen (After Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Initial	7.7					
Day 1	8.5					
Day 2	7.8					
Day 3	8.1					
Day 4	8.1					
Day 5	8.6					
Day 6	8.4					

Dissolved Oxygen (Before Renewal)

	Test Concentration					
	Control	6.25%	12.5%	25.0%	50%	100%
Day 1	8.4	8.4				8.5
Day 2	7.8	7.9				7.8
Day 3	8.4	8.5				8.4
Day 4	8.0	8.3				7.9
Day 5	8.7	8.5				8.7
Day 6	8.7	8.5				8.4
Final	8.6	8.6				8.5

Dilution Water & Effluent Parameters

	Res Cl.	Alkaline	Hard.	Cond.
	mg/L	mg/L	mg/L	µmhos
Eff. Sample 1	0.13	24.7	6	75.5
Eff. Sample 2	<.01	28.8	6	82
Eff. Sample 3	0.07	26.8	6	74.5
Dilution Water		4	4	15

Temperature

Incubator °C	
Initial	24.3
Day 1	24.5
Day 2	24.5
Day 3	25.0
Day 4	24.4
Day 5	24.5
Day 6	24.5
Final	26.0