WSRC-TR--90-598

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**F/H AREA ETF EFFLUENT (H-016 OUTFALL)
CERIODAPHNIA SURVIVAL/REPRODUCTION TEST,
TEST DATE: SEPTEMBER 18, 1990 (U)**

by

WSRC Contact: W. L. Specht

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Aiken, South Carolina 29808

A technical report proposed for approval.
Publication Date: August 1991

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WSRC-TR-90-598

Derivative Classifier
D. B. Moore-Shedrow, Section Manager
Authorized Derivative Classifier

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Approved by :
D. B. Moore-Shedrow, Section Manager
Environmental Sciences Section
Savannah River Laboratory

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SAVANNAH RIVER SITE
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WSRC-TR-90-598

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Greenville, South Carolina 29606
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Ceriodaphnia SURVIVAL/REPRODUCTION TEST

Sample Identification:

ETF
H-016
H-F Area Outfall Effluent
BIO609

Client: Westinghouse-Savannah River Company
Location: Aiken, South Carolina

Test Date: September 18, 1990

INTERPRETATION OF RESULTS

This toxicity test was conducted to determine if the effluent affects the survival or reproduction of the test organisms during a seven day period. The test involved exposing the test organisms to a series of dilutions of the effluent. At each dilution the survival and reproduction of ten test organisms was recorded. Each effluent dilution was compared to a control set of test organisms. Survival data were analyzed by Fisher's Exact Test and Trimmed Spearman Karber Analysis to determine the effluent concentration necessary to cause statistically significant ($p=0.05$) mortality. Reproduction data was analyzed for normality, homogeneity of variance and equality of replicates among dilutions to determine the appropriate statistical test for analysis of statistical differences in reproduction among dilutions. Results are summarized as follows:

Acute Toxicity:

Trimmed Spearman Karber Analysis

LC50= 46.70 % Effluent

Lower 95% Confidence Limit:	32.74 % effluent
Upper 95% Confidence Limit:	66.61 % effluent

Fisher's Exact Test

NOEC=	30.0% Effluent
LOEC=	100.0% Effluent
ChV=	54.8% Effluent

Chronic Toxicity ;

Dunnett's t Test

(NOEC) No Observed Effect Conc.:	30.0%
(LOEC) Lowest Observed Effect Conc.:	100.0%
Chronic Value:	54.80%
	($p=0.05$)

TEST SYSTEM

Client: Westinghouse-Savannah River Company
Start Date: September 18, 1990

Test Type: 7 Day Chronic Toxicity - Reproduction Test
Test Location: Chem-Nuclear Laboratory Services

Test Organism: Ceriodaphnia dubia Source: CNLS
Age: <24 hrs

Test Procedure: Short-Term Methods for Estimating the Chronic Toxicity
of Effluents and Receiving Waters to Freshwater Organisms.
EPA 600/4-85/014 Method 1002

Test vessels: 20 ml plastic beakers
Amount Test Soln: 15 ml / replicate
Replicates/Concentration: 10 (test vessels randomized)
Test Organisms/Replicate: 1

of Test Concentrations Used (excluding control): 5
Test Solution Renewal: Daily

Food Source: 0.10 ml Selenastrum ($3.0-3.5 \times 10^7$ cells/ml)
and 0.05 ml YCT daily / test vessel

Test Set By: Joel Stephens - Biologist

Joel A. Stephens

Test Results Checked By: Robert W. Kelley, Ph.D
Biology Laboratory Manager

Robert W. Kelley

SAMPLING INFORMATION

Three effluent samples were collected by and transported to Enwright Environmental Consulting Laboratories by same day delivery. Samples were collected in 1 L plastic cubitainers. Sample coolers were packed with ice during shipping.

Client: Westinghouse-Savannah River Company
Sample Identification: H-F Area Outfall Effluent
Start Date: September 18, 1990

	Sample #1	Sample #2	Sample #3
Lab #	BIO609-1	BIO609-2	BIO609-3
Type	grab	grab	grab
Date sampled	9/17/90	9/19/90	9/21/90
Time sampled	9:50 AM	9:50 AM	2:00 PM
Days of use	0,1	2,3	4,5,6
Maximum hold time:	57 hr	56 hr	76 hr

Effluent Field Parameters	Sample #1	Sample #2	Sample #3
D.O. (ppm)	7.2	7.2	7.6
pH	6.5	6.9	6.8
Temp (C)	24	22	20
Res Cl (ppm)	<0.05*	<0.05*	<0.05*

* Res Cl is a laboratory reading

RESULTS

Client: Westinghouse-Savannah River Company
Sample Identification: H-F Area Outfall Effluent
Start Date: September 18, 1990

SURVIVAL DATA (At Test Termination)

	Effluent Concentration					
	0.0%	1.0%	3.0%	10.0%	30.0%	100.0%
Survival	9 90%	9 90%	10 100%	8 80%	10 100%	0 0%
Mortality (7 day)	1 10%	1 10%	0 0%	2 20%	0 0%	10 100%
# Males	0	0	0	0	0	0

SURVIVAL - DATA ANALYSIS

Trimmed Spearman Karber Analysis

		Lower	Upper
LC50=	46.70 % Effluent	32.74	66.61 % Effluent

Fisher's Exact Test

NOEC= 30.0% Effluent
LOEC= 100% Effluent
ChV= 54.8% Effluent

RESULTS

Client: Westinghouse-Savannah River Company
Sample Identification: H-F Area Outfall Effluent
Start Date: September 18, 1990

CHRONIC TOXICITY - Daily Reproduction Totals

	Rep	Day 4	Day 5	Day 6	Day 7	Total
Control	A	6	10	7	5	28
	B	4	9	0	9	22
	C	1	7	8	0	16
	D	2	6	10	10	28
	E	4	6	5	0	15
	F	0	6	7	1	14
	G	5	8	9	0	22
	H	0	0	3	8	11
	I	5	2	5	9	21
	J	X	X	X	X	0
	K	27	54	54	42	177
1.0% Effluent	A	5	0	2	20	27
	B	1	7	1	9	18
	C	2	7	11	0	20
	D	3	8	9	2	22
	E	1	0	11	8	20
	F	3	8	0	0	11
	G	3	8	0	11	22
	H	6	8	0	11	25
	I	4	X	X	X	4
	J	3	0	5	3	11
	Total	31	46	39	64	180
3.0% Effluent	A	1	0	0	0	1
	B	0	6	8	3	17
	C	3	0	0	3	6
	D	4	7	8	1	20
	E	2	4	0	0	6
	F	2	6	7	0	15
	G	3	0	1	8	12
	H	4	6	1	0	11
	I	6	7	0	9	22
	J	6	6	0	0	12
	Total	31	42	25	24	122

RESULTS

Client: Westinghouse-Savannah River Company
 Sample Identification: H-F Area Outfall Effluent
 Start Date: September 18, 1990

CHRONIC TOXICITY - Daily Reproduction Totals

	Rep	Day 4	Day 5	Day 6	Day 7	Total
10.0% Effluent	A	4	4	0	7	15
	B	0	3	0	3	6
	C	4	0	0	X	4
	D	4	0	9	10	23
	E	0	4	6	0	10
	F	0	7	0	12	19
	G	0	5	8	0	13
	H	0	8	8	0	16
	I	2	0	0	X	2
	J	3	4	7	0	14
	Total	17	35	38	32	122
30.0% Effluent	A	0	8	0	5	13
	B	0	1	11	9	21
	C	0	7	8	0	15
	D	6	10	0	10	26
	E	0	4	2	1	7
	F	2	7	0	0	9
	G	0	0	6	0	6
	H	4	0	0	11	15
	I	4	1	0	11	16
	J	4	3	3	12	22
	Total	20	41	30	59	150
100.0% Effluent	A	X	X	X	X	0
	B	X	X	X	X	0
	C	X	X	X	X	0
	D	X	X	X	X	0
	E	X	X	X	X	0
	F	X	X	X	X	0
	G	X	X	X	X	0
	H	X	X	X	X	0
	I	X	X	X	X	0
	J	X	X	X	X	0
	Total	0	0	0	0	0

X represents the mortality of the test organism.

RESULTS

Client: Westinghouse-Savannah River Company
Sample Identification: H-F Area Outfall Effluent
Start Date: September 18, 1990

CHRONIC TOXICITY - Statistical Analysis

ANOVA and Dunnett's Procedure: (Assumes Data is Normally Distributed)

Conc.	0.0%	1.0%	3.0%	10.0%	30.0%	100.0%
Average Young/ Female	17.7	18.0	12.2	12.2	15.0	0.0
"t" Value		-0.06	1.22	1.15	0.60	
Reproduction significantly less than control? (95% confidence)		no	no	no	no	

95% conf.

(NOEC) No Observed Effect Conc.: 30.0%
(LOEC) Lowest Observed Effect Conc.: 100.0%
Chronic Value: 54.80%

The data are normally distributed.
The data are homogenous in variance.
The number of replicates in each concentration is equal.
The appropriate statistical test is Dunnett's t Test

WATER CHEMISTRY ANALYSIS

Client: Westinghouse-Savannah River Company
Sample Identification: H-F Area Outfall Effluent
Start Date: September 18, 1990

Dilution Water

Source: Upper Three Runs Creek (Upstream of Road C Bridge).
Preparation: Filtered (37 micron net)

Effluent

Conductivity Measurements (umhos)

Sample 1	120
Sample 2	190
Sample 3	120

Tritium Measurements (pCi/mL)

Sample 1	5140
Sample 2	6000
Sample 3	6500

Temperature Measurements (°C)

Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
24.9	25.1	25.4	24.2	24.6	25.3	24.9	26.0

WATER CHEMISTRY ANALYSIS

Client: Westinghouse-Savannah River Company
 Sample Identification: H-F Area Outfall Effluent
 Start Date: September 18, 1990

Test Solutions

	pH	D.O. (mg/L)	D.O. (%)	Conduct. (umhos)	Hardness mg/l	Alkalin. (umhos) mg/l
CONTROL						
Initial	6.2	8.0	99%	20	3.708	5.94
Day 1 (old)	6.5	7.5	94%			
Day 1 (new)	6.6	8.1	101%	25	5.562	5.148
Day 2 (old)	7.4	7.9	99%			
Day 2 (new)	6.9	8.3	104%	20	6.386	8.91
Day 3 (old)	7.1	8.0	98%			
Day 3 (new)	7.2	8.3	101%	20	5.15	8.91
Day 4 (old)	6.6	7.6	94%			
Day 4 (new)	6.5	8.0	99%	30	6.386	5.94
Day 5 (old)	7.2	7.9	99%			
Day 5 (new)	7.4	7.9	99%	25	5.15	5.74
Day 6 (old)	7.6	7.6	94%			
Day 6 (new)	7.3	7.8	96%	25	4.944	5.94
Final	7.3	7.6	97%			

1.0% Effluent

	D.O. (mg/L)	D.O. (%)	Conduct (umhos)	pH
Initial	8.2	101%	20	6.1
Day 1 (old)	8.2	103%		6.6
Day 1 (new)	8.3	104%	25	6.5
Day 2 (old)	8.1	101%		7.3
Day 2 (new)	8.3	104%	20	6.9
Day 3 (old)	8.0	98%		7.1
Day 3 (new)	8.2	100%	20	7.2
Day 4 (old)	7.2	89%		6.6
Day 4 (new)	8.0	99%	20	6.5
Day 5 (old)	7.5	94%		7.3
Day 5 (new)	7.9	99%	20	7.4
Day 6 (old)	7.4	91%		7.6
Day 6 (new)	7.8	96%	20	7.1
Final	7.6	97%		7.2

WATER CHEMISTRY ANALYSIS

Client: Westinghouse-Savannah River Company
 Sample Identification: H-F Area Outfall Effluent
 Start Date: September 18, 1990

	D.O. (ppm)	D.O. (%)	Conduct (umhos)	pH
<hr/>				
3.0% Effluent				
Initial	8.2	101%	20	6.1
Day 1 (old)	8.2	103%		6.6
Day 1 (new)	8.3	104%	25	6.5
Day 2 (old)	8.3	104%		7.2
Day 2 (new)	8.2	103%	20	6.8
Day 3 (old)	8.1	99%		7.1
Day 3 (new)	8.2	100%	20	7.2
Day 4 (old)	7.3	90%		6.6
Day 4 (new)	7.9	98%	20	6.5
Day 5 (old)	7.6	95%		7.2
Day 5 (new)	8.0	100%	20	7.4
Day 6 (old)	7.6	94%		7.5
Day 6 (new)	7.8	96%	25	7.3
Final	7.6	97%		7.2

	D.O. (ppm)	D.O. (%)	Conduct (umhos)	pH
<hr/>				
10.0% Effluent				
Initial	7.8	96%	28	7.9
Day 1 (old)	7.6	95%		7.9
Day 1 (new)	8.0	100%	25	8.0
Day 2 (old)	7.5	94%		8.1
Day 2 (new)	7.8	98%	25	8.0
Day 3 (old)	7.6	93%		8.1
Day 3 (new)	7.9	96%	30	8.1
Day 4 (old)	7.6	94%		8.1
Day 4 (new)	8.1	100%	29	8.0
Day 5 (old)	8.1	101%		8.1
Day 5 (new)	8.4	105%	29	8.2
Day 6 (old)	8.2	101%		8.2
Day 6 (new)	8.0	99%	26	7.7
Final	7.9	101%		7.4

WATER CHEMISTRY ANALYSIS

Client: Westinghouse-Savannah River Company
 Sample Identification: H-F Area Outfall Effluent
 Start Date: September 18, 1990

	D.O. (ppm)	D.O. (%)	Conduct (umhos)	pH
30.0% Effluent				
Initial	8.3	102%	50	6.3
Day 1 (old)	8.2	103%		6.8
Day 1 (new)	8.3	104%	50	6.6
Day 2 (old)	7.0	88%		7.2
Day 2 (new)	8.3	104%	40	6.9
Day 3 (old)	8.0	98%		7.2
Day 3 (new)	8.3	101%	40	7.2
Day 4 (old)	7.3	90%		6.7
Day 4 (new)	8.0	99%	40	6.6
Day 5 (old)	8.2	103%		7.3
Day 5 (new)	8.2	103%	40	7.4
Day 6 (old)	7.5	93%		7.5
Day 6 (new)	8.0	99%	45	7.4
Final	7.6	97%		7.2

	pH	D.O. (mg/L)	D.O. (%)	Conduct (umhos)	Alkal. (mg/L)	Hardness (mg/L)
100.0% Effluent						
Initial	6.9	8.3	102%	120	10.89	2.678
Day 1 (old)	7.0	7.7	96%			
Day 1 (new)	7.0	8.3	104%	125	13.464	2.678
Day 2 (old)	7.5	7.2	90%			
Day 2 (new)	7.5	8	100%	80	11.88	3.09
Day 3 (old)	7.5	7.9	96%			
Day 3 (new)	7.7	8.3	101%	75	10.296	2.884
Day 4 (old)	7.1	7.3	90%			
Day 4 (new)					11.682	2.678
Day 5 (old)						
Day 5 (new)					9.9	2.884
Day 6 (old)						
Day 6 (new)					8.91	3.914
Final						

QUALITY CONTROL

Client: Westinghouse-Savannah River Company
Sample Identification: H-F Area Outfall Effluent
Start Date: September 18, 1990

Culture Health:

Sensitivity: Culture organisms were exposed to NaCl as a reference toxicant.

Current LC50:	0.71 g/L
Central Tendency:	0.81 g/L
Standard Dev.:	0.43
Upper Limit:	1.67 g/L (+2 std. dev.)
Lower Limit:	-0.05 g/L (-2 std. dev.)
Current LC50 is	0.23 standard deviation units below normal.

**DATE
FILMED**
8/12/92