



NUCLEAR FUEL SERVICES, INC.

a subsidiary of The Babcock & Wilcox Company

■ 1205 banner hill road ■ erwin, tn 37650 ■ phone 423.743.9141
■ www.nuclearfuelservices.com

**CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

21G-12-0181
GOV-05-01-01
ACF-12-0235

September 12, 2012

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

References: 1) Nuclear Fuel Services, Inc. (NFS) NPDES Permit No. TN0002038
2) Letter from Stephanie Fisher to permittee, received on 10-27-08

Dear Mr. Cromer:

As required by Part I, D.1 of NPDES Permit #TN0002038, we hereby submit the original and a copy of the Monthly Discharge Monitoring Report (DMR), EPA Form 3320-1, for August 2012 as Attachment I. Attachment II is the 2012 results for the 48-hour static acute toxicity test.

Laboratory analyses for required permit parameters were performed on sixteen (16) Waste Water Treatment Facility (WWTF) batches discharged during this reporting period. All values were indicated by these analyses to be within their respective permit conditions.

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Ms. Joyce Griffith, Environmental Scientist, at (423) 735-5584. Please reference our unique document identification number (21G-12-0181) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

B. Marie Moore, Manager
Environmental Protection & Industrial Safety

CAH/rrm
Attachment (1): August 2012 DMR

B.M. Moore to Mr. Patrick Cromer
September 12, 2012

21G-12-0181
GOV-05-01-01
ACF-12-0235

cc: U.S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Ave., NE
Suite 1200
Atlanta, GA 30303-1257

Mr. Jeff Horton, Manager
Johnson City Basin
TN Division of Water Pollution Control
2305 Silverdale Road
Johnson City, TN 37601-2162

B.M. Moore to Mr. Patrick Cromer
September 12, 2012

21G-12-0181
GOV-05-01-01
ACF-12-0235

Attachment I
August 2012 DMR

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
Nuclear Fuel Services
 1205 Banner Hill Road
 Erwin, TN 37650
FACILITY Nuclear Fuel Services
LOCATION 1205 Banner Hill Road
 Erwin, TN 37650
 Attn: B. Marie Moore EP&S MGR

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
 DISCHARGE MONITORING REPORT (DMR)
 TN0002038
 PERMIT NUMBER
 001-G
 DISCHARGE NUMBER

DMR Mailing ZIP CODE: 37650
 MAJOR (SUBR 06)
 TREATED PROCESS WASTEWATER
 External Outfall

MONITORING PERIOD
 FROM 08/01/2012 TO 08/31/2012

No Discharge

PARAMETER	QUANTITY OR LOADING		QUALITY OR CONCENTRATION		NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
	VALUE	UNITS	VALUE	UNITS			
OXYGEN DEMAND, CHEM. (HIGH LEVEL) (COD)	*****	*****	*****	*****	0	16	GRAB
00340 1 0 EFFLUENT GROSS	*****	*****	*****	*****		Monthly	GRAB
pH	*****	*****	7.29	*****	0	16	GRAB
00400 1 0 EFFLUENT GROSS	*****	*****	6	*****		Once Per Batch	GRAB
SOLIDS, TOTAL SUSPENDED	*****	*****	MINIMUM	*****	0	16	GRAB
00530 1 0 EFFLUENT GROSS	*****	*****	30	MO AVG		Once Per Batch	GRAB
SOLIDS, SETTLEABLE	*****	*****	*****	*****	0	16	GRAB
00545 1 0 EFFLUENT GROSS	*****	*****	*****	*****		Once Per Batch	GRAB
NITROGEN, AMMONIA TOTAL (as N)	*****	*****	*****	*****	0	16	GRAB
00610 1 0 EFFLUENT GROSS	*****	*****	12.81	*****		Once Per Batch	GRAB
NITRITE PLUS NITRATE DET. (as N)	*****	*****	20	MO AVG		Once Per Batch	GRAB
00630 1 0 EFFLUENT GROSS	*****	*****	*****	*****	0	16	GRAB
FLUORIDE, TOTAL (as F)	*****	*****	*****	*****		Once Per Batch	GRAB
00951 1 0 EFFLUENT GROSS	*****	*****	*****	*****	0	16	GRAB
NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	B. Marie Moore, Manager		SIGNATURE OF PRINCIPAL EXECUTIVE		TELEPHONE		DATE
Environmental Protection & Industrial Safety					423-743-9141		09/12/2012
TYPED OR PRINTED			OFFICER OR AUTHORIZED AGENT		AREA CODE NUMBER		MM/DD/YYYY
					423-743-9141		MM/DD/YYYY

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

THE MERCURY (Hg) LMT APPLIES ONLY IF DISCHARGES CONTAINING Hg OCCUR 4+ CONSECUTIVE DAYS/MK DURING THE MON. PERIOD. OTHERWISE, ONLY THE DAILY MAX LMT APPLIES. IF ANY TEST RESULT FOR Hg IS < THE MIN. QUANT. LEVEL (0.0002 MG/L), THEN ZERO MAY BE USED FOR DMR CALCS AND REPORT. RQRMNTS.

Nuclear Fuel Services
 1205 Banner Hill Road
 Erwin, TN 37650
 Nuclear Fuel Services
 1205 Banner Hill Road
 Erwin, TN 37650
 Attn: B. Marie Moore EP&S MGR

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)


TN0002038
 PERMIT NUMBER
 001-G
 DISCHARGE NUMBER

MONITORING PERIOD
 MM/DD/YYYY TO MM/DD/YYYY
 08/01/2012 TO 08/31/2012

DMR Mailing ZIP CODE: 37650

MAJOR (SUBR 06)
 TREATED PROCESS WASTEWATER
 External Outfall

No Discharge

PARAMETER	QUANTITY OR LOADING		QUALITY OR CONCENTRATION		UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
	VALUE	UNITS	VALUE	UNITS				
CADMIUM, TOTAL (as Cd)	*****	*****	0.00151	mg/L	0	01	GRAB	
01027 1 0 EFFLUENT GROSS	*****	*****	DAILY MX	mg/L		Monthly	GRAB	
COPPER, TOTAL (as Cu)	*****	*****	0.00313	mg/L	0	01	GRAB	
01042 1 0 EFFLUENT GROSS	*****	*****	DAILY MX	mg/L		Monthly	GRAB	
LEAD, TOTAL (as Pb)	*****	*****	BDL < 0.0165	mg/L	0	01	GRAB	
01051 1 0 EFFLUENT GROSS	*****	*****	DAILY MX	mg/L		Monthly	GRAB	
SILVER, TOTAL (as Ag)	*****	*****	BDL < 0.001	mg/L	0	01	GRAB	
01077 1 0 EFFLUENT GROSS	*****	*****	DAILY MX	mg/L		Monthly	GRAB	
URANIUM, NATURAL, TOTAL	*****	*****	BDL < 0.90	mg/L	0	16	GRAB	
22708 1 0 EFFLUENT GROSS	*****	*****	MO AVG	mg/L		Once Per Batch	GRAB	
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	0.014175	MGD	*****	*****	0	16	ESTIMA	
50050 1 0 EFFLUENT GROSS	Req. Mon. MO AVG	MGD	*****	*****		Once Per Batch	ESTIMA	
CHLORINE, TOTAL RESIDUAL	*****	*****	MNR	mg/L	0	0	GRAB	
50060 1 0 EFFLUENT GROSS	*****	*****	DAILY MX	mg/L		Once Per Batch	GRAB	
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified persons properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons already responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.					TELEPHONE: 423-743-9141 NUMBER: MM/DD/YYYY		DATE: 09/12/2012	
NAME/TITLE PRINCIPAL EXECUTIVE OFFICER B. Marie Moore, Manager Environmental Protection & Industrial Safety					SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT 		AREA CODE NUMBER: 423-743-9141 MM/DD/YYYY: MM/DD/YYYY	
TYPED OR PRINTED					COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here) THE MERCURY (Hg) LMT APPLIES ONLY IF DISCHARGES CONTAINING Hg OCCUR 4+ CONSECUTIVE DAYS/MK DURING THE MON. PERIOD. OTHERWISE, ONLY THE DAILY MAX LMT APPLIES. IF ANY TEST RESULT FOR Hg IS < THE MIN. QUANT. LEVEL (0.0002 MG/L), THEN ZERO MAY BE USED FOR DMR CALCS AND REPORT. RGRMNTS.		MM/DD/YYYY: MM/DD/YYYY	

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

DISCHARGE MONITORING REPORT (DMR)

Form Approved
CMB No. 2540-004

DMR Mailing ZIP CODE: 37650
MAJOR (SUBR.06)
TREATED PROCESS WASTEWATER
External Outfall

001-G	DISCHARGE NUMBER
TN0002038	PERMIT NUMBER

MM/DD/YYYY	MM/DD/YYYY
08/01/2012	08/31/2012


Attn: B. Marie Moore EP&S MGR

FROM

TO

No Discharge

PARAMETER	QUANTITY OR LOADING		QUALITY OR CONCENTRATION		UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
	VALUE	UNITS	VALUE	UNITS				
MERCURY, TOTAL (as Hg)	*****	*****	MNR	*****	mg/L	0	16	GRAB
71900 1 0 EFFLUENT GROSS	*****	*****	.00037 MO AVG	*****	mg/L	0	Once Per Batch	GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER B. Marie Moore, Manager Environmental Protection & Industrial Safety	TELEPHONE	DATE
TYPED OR PRINTED	AREA CODE NUMBER 423-743-9141	MM/DD/YYYY 09/12/2012
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT 		

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

THE MERCURY (Hg) LIMIT APPLIES ONLY IF DISCHARGES CONTAINING Hg OCCUR 4+ CONSECUTIVE DAYS/WK DURING THE MON. PERIOD. OTHERWISE, ONLY THE DAILY MAX LIMIT APPLIES. IF ANY TEST RESULT FOR Hg IS < THE MIN. QUANT. LEVEL (0.0002 MG/L), THEN ZERO MAY BE USED FOR DMR CALCS AND REPORT. RORMNTS. AUGUST 2012 DID NOT HAVE MORE THAN 4 CONSECUTIVE DAYS OF DISCHARGE.

PERMITTEE NAME/ADDRESS
 (Include Facility Name/Location if Different)
 NAME Nuclear Fuel Services
 ADDRESS 1205 Banner Hill Road
 Erwin, TN 37650
 FACILITY Nuclear Fuel Services
 LOCATION 1205 Banner Hill Road
 Erwin, TN 37650
 Attn: Ms. B. Marie Moore EP&S MGR

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
 DISCHARGE MONITORING REPORT (DMR)
 TN0002038 001-G
 PERMIT NUMBER DISCHARGE NUMBER

DMR Mailing ZIP CODE: 37650
 MAJOR (SUBR 06)
 TREATED PROCESS WASTEWATER
 External Outfall

MONITORING PERIOD
 FROM 12/01/2012 TO 12/31/2012
 MM/DD/YYYY MM/DD/YYYY

No Discharge

PARAMETER	QUANTITY OR LOADING			QUALITY OR CONCENTRATION			UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
	VALUE	UNITS	VALUE	VALUE	VALUE	VALUE				
Mercury, total (as Hg)	*****	*****	MNR	*****	MNR	MNR	0	0	Once per Batch	GRAB
71900 Effluent Gross	*****	*****	.00037 MO AVG	*****	.05 DAILY MX	mg/L	0	01	365	GRAB
LC50 Static 48-Hr Acute Ceriodaphnia	*****	*****	25.0	*****	*****	§	0	01	365	GRAB
TAA3B 1 0 Effluent Gross	*****	*****	Req. Mon. VALUE	*****	*****	§	0	Annual	Annual	GRAB
LC50 Static 48-Hr Acute Pimaphales	*****	*****	40.613	*****	*****	§	0	01	365	GRAB
TAA6C 1 0 Effluent Gross	*****	*****	Req. Mon. VALUE	*****	*****	§	0	Annual	Annual	GRAB

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
 B. Marie Moore, Manager
 Environmental Protection & Industrial Safety

TELEPHONE 423-743-9141
 AREA CODE NUMBER

DATE 9/12/2012
 MM/DD/YYYY

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT
 BMM

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)
 This DMR sheet only applies to Toxicity Testing. The toxicity samples were collected on 8/15/12. Toxicity laboratory results are identified in Attachment II (2012 48-Hr. Static Acute Toxicity Test Results).
 The December 2012 mercury will be reported in December.

B.M. Moore to Mr. Patrick Cromer
September 12, 2012

21G-12-0181
GOV-05-01-01
ACF-12-0235

Attachment II

2012 48-Hour Static Acute Toxicity Test Results



29-Aug-2012

Carol Hale
Nuclear Fuel Services, Inc.
1205 Banner Hill Road
Erwin, TN 37650

Re: **WWTF**

Work Order: **1208113**

Dear Carol,

ALS Environmental received 4 samples on 16-Aug-2012 08:20 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 83.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in cursive script that reads 'Rebecca Kiser'.

Electronically approved by: Rebecca Kiser

Rebecca Kiser

Client: Nuclear Fuel Services, Inc.
Project: WWTF
Work Order: 1208113

Work Order Sample Summary

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
1208113-01	No. 1 Grab	Water		8/15/2012 02:00	8/16/2012 08:20	<input type="checkbox"/>
1208113-02	No. 2 Grab	Water		8/15/2012 04:00	8/16/2012 08:20	<input type="checkbox"/>
1208113-03	No. 3 Grab	Water		8/15/2012 06:00	8/16/2012 08:20	<input type="checkbox"/>
1208113-04	No. 4 Grab	Water		8/15/2012 08:00	8/16/2012 08:20	<input type="checkbox"/>

Client: Nuclear Fuel Services, Inc.
Project: WWTF
WorkOrder: 1208113

**QUALIFIERS,
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

<u>Acronym</u>	<u>Description</u>
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SD	Serial Dilution

<u>Units Reported</u>	<u>Description</u>
Tua	Acute Toxic Unit

ALS Group USA, Corp

Date: 29-Aug-12

Client: Nuclear Fuel Servces, Inc.

Project: WWTF

Work Order: 1208113

Sample ID: No. 1 Grab

Lab ID: 1208113-01

Collection Date: 8/15/2012 02:00 AM

Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
ACUTE CERIODAPHNIA Acute C. dubia	4.0		E821-R-02-012	2002 Tua	1	Analyst: MLH 8/16/2012 11:30 AM
ACUTE P. PROMELAS Acute P. promelas	2.38		E821-R-02-012	2000 Tua	1	Analyst: MLH 8/16/2012 11:30 AM

Note:

ALS Group USA, Corp

Date: 29-Aug-12

Client: Nuclear Fuel Services, Inc.
Project: WWTF
Sample ID: No. 2 Grab
Collection Date: 8/15/2012 04:00 AM

Work Order: 1208113
Lab ID: 1208113-02
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
ACUTE CERIODAPHNIA			E821-R-02-012 2002			Analyst: MLH
Acute C. dubia	3.25			Tua	1	8/16/2012 12:45 PM
ACUTE P. PROMELAS			E821-R-02-012 2000			Analyst: MLH
Acute P. promelas	2.46			Tua	1	8/16/2012 12:45 PM

Note:

ALS Group USA, Corp

Date: 29-Aug-12

Client: Nuclear Fuel Services, Inc.

Project: WWTF

Sample ID: No. 3 Grab

Collection Date: 8/15/2012 06:00 AM

Work Order: 1208113

Lab ID: 1208113-03

Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
ACUTE CERIODAPHNIA Acute C. dubia	3.36		E821-R-02-012 2002	Tua	1	Analyst: MLH 8/16/2012 01:30 PM
ACUTE P. PROMELAS Acute P. promelas	2.24		E821-R-02-012 2000	Tua	1	Analyst: MLH 8/16/2012 01:30 PM

Note:

ALS Group USA, Corp

Date: 29-Aug-12

Client: Nuclear Fuel Servces, Inc.**Project:** WWTF**Sample ID:** No. 4 Grab**Collection Date:** 8/15/2012 08:00 AM**Work Order:** 1208113**Lab ID:** 1208113-04**Matrix:** WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
ACUTE CERIODAPHNIA Acute C. dubia	3.60		E821-R-02-012 2002	Tua	1	Analyst: MLH 8/16/2012 02:28 PM
ACUTE P. PROMELAS Acute P. promelas	1.74		E821-R-02-012 2000	Tua	1	Analyst: MLH 8/16/2012 02:28 PM

Note:

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 1 Grab

ALS Sample ID #: 1208113-01
Work Order #: 1456

Date Sampled: 08/15/12 **Time Sampled:** 02:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours

Test Organism: **Common Name:** Water Flea
 Scientific Name: *Ceriodaphnia dubia*
Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 11:30
Test Termination Date: 08/18/12 **Test Termination Time:** 11:00

LC50 (%effluent): 25.0%
Survival in 100% effluent: 0%
Acute Toxic Unit (TU): 4.0

ALS Sample ID # 1208113-01
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.9°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations for ref tox: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 17.678%

TEST ORGANISM DATA

Organism source: In House
 Organism age at start of test: <24 Hours
 Batch #: CDMC21
 all gravid adults as of 08/15/12 18:33

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 4
 Number of test organisms per replicate: 5
 Volume of test solution: 40ml
 Test Chamber: 50ml Glass Beakers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-01
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.2°C	Dissolved Oxygen:	7.89mg/L
pH:	7.60SU	Alkalinity:	70mg/L
Conductivity:	281uS	Hardness:	88mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.2°C	Dissolved Oxygen:	7.22mg/L
pH:	7.56SU	Alkalinity:	70mg/L
Conductivity:	17680uS	Hardness:	1318mg/L
Chlorine	0.03mg/L	Salinity:	10.9%

ADJUSTMENTS: pH No pH adjustment required.
Chlorine No adjustment required.
Dissolved Oxygen No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-01
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	Hours		
			0	24	48
Control (MHSF)	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
6.25%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
12.50%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
25%	A	5	4	3	
	B	5	5	4	
	C	5	3	1	
	D	5	5	2	
50%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	
100%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	

ALS Sample ID # 1208113-01
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50: 25.0%
Calculation Method: Spearman-Kärber
Lower Confidence Limit: 21.411%
Upper Confidence Limit: 29.191%
Acute Toxic Unit (TU): 4.0

MISCELLANEOUS

Was organism stress observed during test: No
Were any test chamber aerated during test: No
Other:

Comments:

Sample temperature upon arrival at laboratory was 0°C.

SAMPLE CHECK-IN

Sample ID Number

Arrival Date/Time: 8/16/12 / 8:20
 Sampling Date/Time: 8/15/12 / 14:00

1208113-01A

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: Cooler
 Arrival Temperature: 0°C
 Sample Description: WWTF #1
 Analysis Requested: Acute C. dubia + P. promelas

Visual Inspection: Color Clear Odor Yes Particulates Yes (white debris)
 Comments: _____

Water Chemistry Analysis:
 Temperature: 14.9 °C
 pH: 7.53 SU
 Conductivity: 14780 uS
 Chorine: 0.03 mg/L

D.O. 7.55 mgO₂/L
 Alkalinity: 70 mg CaCO₃/L
 Hardness: 1318 mg CaCO₃/L
 Salinity: 10.9 %

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 11:10 AM

Bioassay Work Assignment Sheet

Work Description: Acute C. dubia
Assigned to: MLH

Work Order Number: 1456
Client: Nuclear Fuel Services, Inc.
Sample ID Number: 1208013-1

Test Conditions:

Static/Renewal/ Flow Through: Acute Chronic
Test Duration: 24 Hours 48 Hours 96 Hours 7 Days
Dilution Water: EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 -> 0.25 by 0.5

Replicates: 4

Test Temperature: 25 ± 1°C

Organism: P. promelas D. magna D. pulex C. dubia Other

Organism Age at Start of Test: < 24 hrs

Batch Number: COMC 21 all gravid adults as of 8-15-12 @ 18:33

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 11:30
Completion Date/Time: 8-18-12 11:00
Assigned By: RJK

Date: 08/16/12

Standard Environmental

Work Order #: 1456
 Lab #: 1208113-1
 Client: Nuclear Fuel Serv.

Species: Ceriodaphnia dubia

Age: 24hr Batch: CDNC AI

LC50: 25.0%
 Method: Sparman-Karber

Test Initiation: 8-16-12 11:30
 Test Completion: 8-18-12 11:00

Conc	Control (MHSF)		
	Batch #: <u>08/2/12</u>		
0	5	5	5
24	5	5	5
48	5	5	5

Conc	6.25	12.50	25	50	100	
0	5	5	5	5	5	MUH
24	5	5	4	0	0	MUH
48	5	5	3	1	1	MUH

Conc	6.25	12.50	25	50	100
D.O. (mg/L)	7.89	7.75	7.73	7.63	7.44
pH (SU)	7.60	7.86	7.88	7.84	7.74
Conductivity (uS)	2815	1637	2910	5300	9660
Temperature (°C)	24.2	24.4	24.5	24.7	24.9
Alkalinity	70				70
Hardness	88				1318

7.89	8.62	7.99
7.75	8.07	7.81
7.73	7.94	7.79
7.63	8.06	7.61
7.44	7.61	-
7.32	6.33	-

7.60	7.18	7.63
7.86	7.61	7.88
7.88	7.69	7.98
7.84	7.66	7.86
7.74	7.59	-
7.56	7.35	-

2815	312	316
1637	1724	2270
2910	3150	3272
5300	5820	5740
9660	9740	-
17680	1775	-

24.2	25.6	25.9
24.4	25.6	25.9
24.5	25.9	25.9
24.7	25.9	25.9
24.9	25.9	-
25.2	25.9	-

70		
70		

88		
1318		

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 25.000
 95% LOWER CONFIDENCE: 21.411
 95% UPPER CONFIDENCE: 29.191

CONC. % Effluve	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	10.	50.00	.5881D+02
50.00	20.	20.	100.00	.9537D-04
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 12.50 AND 50.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 25.000

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

DATE: 08/16/12 TEST NUMBER: 1456 DURATION: 48
 Hours
 SAMPLE: 1208113-01 SPECIES: C dubia

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	25.000	12.500	50.000	37.500
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	25.000	21.411	29.191	7.781

**** = LIMIT DOES NOT EXIST

ALS Sample ID # 1208113-01
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.4°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 35.35%

TEST ORGANISM DATA

Organism source: Aquatic BioSystems
 Organism age at start of test: 2 Days
 Batch #: pp376

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 2
 Number of test organisms per replicate: 10
 Volume of test solution: 200ml
 Test Chamber: 350ml Glass Chambers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-01
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.2°C	Dissolved Oxygen:	7.89mg/L
pH:	7.60SU	Alkalinity:	70mg/L
Conductivity:	281uS	Hardness:	88mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.2°C	Dissolved Oxygen:	7.22mg/L
pH:	7.56SU	Alkalinity:	70mg/L
Conductivity:	17680uS	Hardness:	1318mg/L
Chlorine	0.03mg/L	Salinity:	10.9%

ADJUSTMENTS:

pH	No pH adjustment required.
Chlorine	No adjustment required.
Dissolved Oxygen	No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-01
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	<u>Hours</u>		
			0	24	48
Control (MHSF)	A	10	10	10	
	B	10	10	10	
6.25%	A	10	10	10	
	B	10	10	10	
12.50%	A	10	10	10	
	B	10	10	10	
25%	A	10	10	10	
	B	10	10	10	
50%	A	10	7	3	
	B	10	9	2	
100%	A	10	0	0	
	B	10	0	0	

ALS Sample ID # 1208113-01
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50:	42.045%
Calculation Method:	Spearman-Kärber
95% Confidence Interval (48hr):	
Lower Confidence Limit:	36.764%
Upper Confidence Limit:	48.085%
Acute Toxic Unit (TU):	2.86

MISCELLANEOUS

Was organism stress observed during test:	No
Were any test chamber aerated during test:	No
Other:	

Comments:

Sample temperature upon receipt was 0°C.

SAMPLE CHECK-IN

Sample ID Number

Arrival Date/Time: 8/16/12 / 8:20
 Sampling Date/Time: 8/15/12 / 14:00

1208113-01A

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: Cooler
 Arrival Temperature: 0°C
 Sample Description: WWTF #1
 Analysis Requested: Acute C. dubia + P. promelas

Visual Inspection: Color Clear Odor Yes Particulates Yes (white debris)
 Comments: _____

Water Chemistry Analysis:

Temperature: 14.9 °C
 pH: 7.53 SU
 Conductivity: 14780 uS
 Chlorine: 0.03 mg/L

D.O.: 7.55 mgO₂/L
 Alkalinity: 70 mg CaCO₃/L
 Hardness: 1318 mg CaCO₃/L
 Salinity: 10.9 %

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 11:10 AM

Bioassay Work Assignment Sheet

Work Description: Acute P. promelas
Assigned to: MLH

Work Order Number: 1455
Client: Nuclear Fuel Services, Inc.
Sample ID Number: 1208113-1

Test Conditions:

Static Renewal/ Flow Through: Acute Chronic
Test Duration: 24 Hours 48 Hours 96 Hours 7 Days
Dilution Water: EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 → 6.25 by 0.5

Replicates: 2

Test Temperature: 25 ± 1°c

Organism: P. promelas D. magna D. pulex C. dubia Other

Organism Age at Start of Test: 2 days

Batch Number: PP 376

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 11:30
Completion Date/Time: 8-18-12 11:00
Assigned By: RLK

Date: 08/16/12

Standard Environmental

Work Order #: 1455
 Species: Pimephales promelas
 Lab #: 1208113-1
 Age: 20 days Batch: pp 3710
 Client: Nuclear Fuel Serv.
 LC50: 42.045%
 Method: Sparman-Karber
 Test Initiation: 8-16-12 11:30
 Test Completion: 8-18-12 11:00

Conc	Control (MHSF)		
	Batch #: <u>081212</u>		
0	10	10	Mult
24	10	10	Mult
48	10	10	Mult

Conc	6.25	12.50	25	50	100
0	10	10	10	10	Mult
24	10	10	10	7	Mult
48	10	10	10	3	Mult

Conc	D.O. (mg/L)
Control	7.29
6.25	7.75
12.50	7.73
25	7.63
50	7.44
100	7.27

Conc	pH (SU)
Control	7.60
6.25	7.86
12.50	7.88
25	7.84
50	7.74
100	7.56

Conc	Conductivity (uS)
Control	281.5
6.25	1687
12.50	2910
25	5300
50	9660
100	17680

Conc	Temperature (°C)
Control	24.2
6.25	24.4
12.50	24.5
25	24.7
50	24.9
100	25.2

Conc	Alkalinity
Control	70
6.25	
12.50	
25	
50	
100	70

Conc	Hardness
Control	88
6.25	
12.50	
25	
50	
100	1318

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 42.045
 95% LOWER CONFIDENCE: 36.764
 95% UPPER CONFIDENCE: 48.085

CONC. % Effluve	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	0.	.00	.9537D-04
50.00	20.	15.	75.00	.2069D+01
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 50.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 97.9304 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 41.494

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

DATE: 08/16/12 TEST NUMBER: 1455 DURATION: 48
 Hours
 SAMPLE: 1208113-01 SPECIES: P promelas

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	41.494	25.000	50.000	25.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	42.045	36.764	48.085	11.321

**** = LIMIT DOES NOT EXIST

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 2 Grab

ALS Sample ID #: 1208113-02
Work Order #: 1458
Date Sampled: 08/15/12 **Time Sampled:** 04:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours

Test Organism: **Common Name:** Water Flea
 Scientific Name: *Ceriodaphnia dubia*
Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 12:45
Test Termination Date: 08/18/12 **Test Termination Time:** 11:50

LC50 (%effluent): 30.779%
Survival in 100% effluent: 0%
Acute Toxic Unit (TU): 3.25

ALS Sample ID # 1208113-02
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.9°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations for ref tox: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 17.678%

TEST ORGANISM DATA

Organism source: In House
 Organism age at start of test: <24 Hours
 Batch #: CDMC21
 all gravid adults as of 08/15/12 18:33

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 4
 Number of test organisms per replicate: 5
 Volume of test solution: 40ml
 Test Chamber: 50ml Glass Beakers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-02
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.4°C	Dissolved Oxygen:	7.97mg/L
pH:	7.72SU	Alkalinity:	70mg/L
Conductivity:	278uS	Hardness:	88mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.6°C	Dissolved Oxygen:	5.89mg/L
pH:	7.59SU	Alkalinity:	66mg/L
Conductivity:	18150uS	Hardness:	1312mg/L
Chlorine	0.00mg/L	Salinity:	10.6%

ADJUSTMENTS:	pH	No pH adjustment required.
	Chlorine	No adjustment required.
	Dissolved Oxygen	No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-02
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	Hours		
			0	24	48
Control (MHSF)	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
6.25%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
12.50%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
25%	A	5	5	5	
	B	5	3	3	
	C	5	5	4	
	D	5	5	4	
50%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	
100%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	

ALS Sample ID # 1208113-02
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50:	30.779%
Calculation Method:	Spearman-Kärber
Lower Confidence Limit:	27.189%
Upper Confidence Limit:	34.842%
Acute Toxic Unit (TU):	3.25

MISCELLANEOUS

Was organism stress observed during test:	No
Were any test chamber aerated during test:	No
Other:	

Comments:

Sample temperature upon arrival at laboratory was 0°C.

SAMPLE CHECK-IN

Sample ID Number

Arrival Date/Time: 8/16/12 / 8:20
 Sampling Date/Time: 8/15/12 / 16:00

1208113-2

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: cooler
 Arrival Temperature: 0c
 Sample Description: WWTF #2
 Analysis Requested: Acute C. dubia & P. promelas

Visual Inspection: Color Clear Odor yes Particulates yes (white debris)
 Comments: _____

Water Chemistry Analysis:
 Temperature: 9.3 °C D.O.: 6.10 mgO₂/L
 pH: 7.73 SU Alkalinity: 60 mg CaCO₃/L
 Conductivity: 12580 uS Hardness: 1312 mg CaCO₃/L
 Chlorine: 0.00 mg/L Salinity: 10.1 ‰

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 12:00

Bioassay Work Assignment Sheet

Work Description: Acute C. Dubia

Work Order Number: 1458
Client: Nuclear Fuel Serv.
Sample ID Number: 1208113-2

Assigned to: MLH

Test Conditions:

Static/Renewal/ Flow Through:

Test Duration: 24 Hours

Acute
48 Hours

Chronic

96 Hours

7 Days

Dilution Water:

EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 → 6.25 by 0.5

Replicates: 4

Test Temperature: 25 ± 1°

Organism: *P. promelas* *D. magna* *D. pulex* *C. dubia* Other

Organism Age at Start of Test: < 24 hrs

Batch Number: CDMC 21 All gravid adults as of 8-15-12 @ 18:33

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 12:45
Completion Date/Time: 8-18-12 11:50
Assigned By: PK

Date: 08/16/12

Standard Environmental

Work Order #: 1458

Lab #: 1208113-2

Client: Nuclear Fuel Serv.

Species: Ceriodaphnia dubia

Age: 24 hrs Batch: CPMC21

LC50: 21.779%

Method: Spearman-Kärber

Test Initiation: 8-16-12 12:45

Test Completion: 8-18-12 11:50

Conc	Control (MHSF)		
	Batch #: <u>081212</u>		
0	5	5	5
24	5	5	5
48	5	5	5

Conc	6.25	12.50	25	50	100
0	5	5	5	5	5
24	5	5	3	0	0
48	5	5	3	4	4

Control	7.97	7.90	7.99
6.25	7.78	7.93	7.81
12.50	7.70	7.82	7.72
25	7.50	7.73	7.49
50	7.20	7.09	-
100	5.89	7.00	-

D.O. (mg/L)

Control	7.72	7.48	7.66
6.25	7.93	7.73	7.91
12.50	7.88	7.75	7.91
25	7.78	7.71	7.84
50	7.59	7.51	-
100	7.59	7.30	-

pH (SU)

Control	277.6	304	316
6.25	166.6	177.4	184.1
12.50	293.6	316.0	320.0
25	534.0	567.0	573.0
50	990.0	994.0	-
100	1815.0	1783.0	-

Conductivity (uS)

Control	24.4	25.9	25.9
6.25	24.4	25.9	25.9
12.50	24.5	25.9	25.9
25	24.7	25.9	25.9
50	25.1	26.9	-
100	25.6	26.9	-

Temperature (°C)

Control	70		
6.25			
12.50			
25			
50			
100	60		

Alkalinity

Control	88		
6.25			
12.50			
25			
50			
100	1312		

Hardness

Control	MLH	MLH	MLH
6.25	MLH	MLH	MLH
12.50	MLH	MLH	MLH
25	MLH	MLH	MLH
50	MLH	MLH	MLH
100	MLH	MLH	MLH

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 30.779
 95% LOWER CONFIDENCE: 27.189
 95% UPPER CONFIDENCE: 34.842

CONC. % Effluve	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	4.	20.00	.5909D+00
50.00	20.	20.	100.00	.9537D-04
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 50.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE

LEVEL ASSOCIATED WITH THESE LIMITS IS 99.4090 PERCENT.
 AN APPROXIMATE LC50 FOR THIS DATA SET IS 31.012

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

DATE: 08/16/12 TEST NUMBER: 1458 DURATION: 48
 Hours
 SAMPLE: 1208113-02 SPECIES: C dubia

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	31.012	25.000	50.000	25.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	30.779	27.189	34.842	7.652

**** = LIMIT DOES NOT EXIST

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 2 Grab

ALS Sample ID #: 1208113-02
Work Order #: 1457
Date Sampled: 08/15/12 **Time Sampled:** 04:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours
Test Organism: **Common Name:** Fathead Minnow
 Scientific Name: *Promelas pimephales*
Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 12:45
Test Termination Date: 08/18/12 **Test Termination Time:** 11:50

LC50 (% effluent): 40.613%
Survival in 100% effluent: 0%
Acute Toxic Unit (TUa): 2.46

ALS Sample ID # 1208113-02
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.4°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 35.35%

TEST ORGANISM DATA

Organism source: Aquatic BioSystems
 Organism age at start of test: 2 Days
 Batch #: pp376

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 2
 Number of test organisms per replicate: 10
 Volume of test solution: 200ml
 Test Chamber: 350ml Glass Chambers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-02
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.4°C	Dissolved Oxygen:	7.97mg/L
pH:	7.72SU	Alkalinity:	70mg/L
Conductivity:	278uS	Hardness:	88mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.6°C	Dissolved Oxygen:	5.89mg/L
pH:	7.59SU	Alkalinity:	66mg/L
Conductivity:	18150uS	Hardness:	1312mg/L
Chlorine	0.00mg/L	Salinity:	10.6%

ADJUSTMENTS:	pH	No pH adjustment required.
	Chlorine	No adjustment required.
	Dissolved Oxygen	No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-02
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	Hours		
			0	24	48
Control (MHSF)	A	10	10	10	
	B	10	10	10	
6.25%	A	10	10	10	
	B	10	10	10	
12.50%	A	10	10	10	
	B	10	10	10	
25%	A	10	10	10	
	B	10	9	9	
50%	A	10	5	2	
	B	10	7	3	
100%	A	10	0	0	
	B	10	0	0	

ALS Sample ID # 1208113-02
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50: 40.613%
Calculation Method: Spearman-Kärber
95% Confidence Interval (48hr):
Lower Confidence Limit: 34.946%
Upper Confidence Limit: 47.198%
Acute Toxic Unit (TU): 2.46

MISCELLANEOUS

Was organism stress observed during test: No
Were any test chamber aerated during test: No
Other:

Comments:

Sample temperature upon receipt was 0°C.

SAMPLE CHECK-IN

Sample ID Number

Arrival Date/Time: 8/16/12 | 8:20
 Sampling Date/Time: 8/15/12 | 16:00

1208113-2

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: cooler
 Arrival Temperature: 0c
 Sample Description: WWTP #2
 Analysis Requested: Acute C. dubia & P. promelas

Visual Inspection: Color Clear Odor yes Particulates yes (white debris)
 Comments: _____

Water Chemistry Analysis:

Temperature: 9.3 °C
 pH: 7.73 SU
 Conductivity: 12580 uS
 Chlorine: 0.00 mg/L

D.O.: 6.10 mgO₂/L
 Alkalinity: 60 mg CaCO₃/L
 Hardness: 131 mg CaCO₃/L
 Salinity: 10.6 %

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 12:00

Bioassay Work Assignment Sheet

Work Description: Acute P. promelas
Assigned to: MLH

Work Order Number: 1457
Client: Nuclear Fuel Serv.
Sample ID Number: 1208113-2

Test Conditions:

Static/Renewal/ Flow Through: Acute Chronic
Test Duration: 24 Hours 48 Hours 96 Hours 7 Days

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 -> 0.25 by 0.5

Replicates: 2

Test Temperature: 25 ± 1°C

Organism: P. promelas D. magna D. pulex C. dubia Other

Organism Age at Start of Test: 2 days

Batch Number: pp 376

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 12:45

Completion Date/Time: 8-18-12 11:50

Assigned By: RLK

Date: 08/16/12

Standard Environmental

Work Order #: 1457

Species: *Pimephales promelas*

Lab #: 1208113-2

Age: 2 day Batch: PP 3710

Client: Nuclear Fuel Serv.

LC50: 40.613%

Test Initiation: 8-16-12 12:45

Method: Sparman-Karber

Test Completion: 8-18-12 11:50

Conc	Control (MHSF)
0	10 10
24	10 10
48	10 10

Batch #: 081212

Conc	0.25	12.50	25	50	100
0	10 10	10 10	10 10	10 10	10 10
24	10 10	10 10	10 9	5 7	0 0
48	10 10	10 10	10 9	2 3	- -

Control	0.25	12.50	25	50	100
7.97	7.90	7.50	7.78	7.71	7.68
7.78	7.93	7.42	7.93	7.51	7.46
7.70	7.82	7.28	7.88	7.28	-
7.50	7.73	6.99	7.78	7.51	7.46
7.00	7.09	6.19	7.78	7.28	-
6.89	5.28	-	7.59	7.28	-
MLH	MLH	MLH	MLH	MLH	MLH

D.O. (mg/L)

7.97	7.90	7.50
7.78	7.93	7.42
7.70	7.82	7.28
7.50	7.73	6.99
7.00	7.09	6.19
6.89	5.28	-
MLH	MLH	MLH

pH (SU)

7.72	7.48	7.41
7.93	7.73	7.69
7.93	7.75	7.72
7.88	7.71	7.68
7.78	7.51	7.46
7.59	7.28	-
MLH	MLH	MLH

Conductivity (uS)

277.6	304	304
1666	1774	1812
2936	3160	3130
5340	5670	5740
9900	9940	10340
18150	7080	-
MLH	MLH	MLH

Temperature (°C)

24.4	25.9	25.9
24.4	25.9	25.9
24.5	25.9	25.9
24.7	25.9	25.9
25.1	25.9	25.9
25.6	25.8	-
MLH	MLH	MLH

Alkalinity

70		
60		
MLH		MLH

Hardness

88		
1312		
MLH		MLH

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 40.613
 95% LOWER CONFIDENCE: 34.946
 95% UPPER CONFIDENCE: 47.198

CONC. % Effluve	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	1.	5.00	.2003D-02
50.00	20.	15.	75.00	.2069D+01
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 50.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 97.9285 PERCENT. AN APPROXIMATE LC50 FOR THIS DATA SET IS 39.942

RESULTS USING MOVING AVERAGE

SPAN	G	LC50	95% CONFIDENCE LIMIT
3	.051	40.61	34.06 49.15

***** RESULTS CALCULATED BY PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT
7	.195	1.00	1.00

SLOPE = 7.82
 95% CONFIDENCE LIMITS: 4.36 AND 11.27

LC50= 40.81
 95% CONFIDENCE LIMITS: 34.48 AND 47.92

LC1 = 20.56
 95% CONFIDENCE LIMITS: 11.41 AND 26.37

DATE: 08/16/12 TEST NUMBER: 1457 DURATION: 48 Hours
SAMPLE: 1208113-02 SPECIES: P promelas

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	39.942	25.000	50.000	25.000
MAA	40.609	34.062	49.146	15.084
PROBIT	40.812	34.480	47.925	13.445
SPEARMAN	40.613	34.946	47.198	12.252

**** = LIMIT DOES NOT EXIST

DATE: 08/16/12

TEST NUMBER: 1457

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 3 Grab

ALS Sample ID #: 1208113-03
Work Order #: 1460
Date Sampled: 08/15/12 **Time Sampled:** 06:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours

Test Organism: **Common Name:** Water Flea
 Scientific Name: *Ceriodaphnia dubia*

Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 13:30
Test Termination Date: 08/18/12 **Test Termination Time:** 12:30

LC50 (%effluent): 29.730%
Survival in 100% effluent: 0%
Acute Toxic Unit (TU): 3.36

ALS Sample ID # 1208113-03
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.9°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations for ref tox: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 17.678%

TEST ORGANISM DATA

Organism source: In House
 Organism age at start of test: <24 Hours
 Batch #: CDMC20
 all gravid adults as of 08/15/12 18:27

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 4
 Number of test organisms per replicate: 5
 Volume of test solution: 40ml
 Test Chamber: 50ml Glass Beakers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-03
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.6°C	Dissolved Oxygen:	7.59mg/L
pH:	7.54SU	Alkalinity:	68mg/L
Conductivity:	306uS	Hardness:	84mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.4°C	Dissolved Oxygen:	6.85mg/L
pH:	7.59SU	Alkalinity:	72mg/L
Conductivity:	18670uS	Hardness:	1308mg/L
Chlorine	0.00mg/L	Salinity:	10.7%

ADJUSTMENTS:	pH	No pH adjustment required.
	Chlorine	No adjustment required.
	Dissolved Oxygen	No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-03
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	Hours		
			0	24	48
Control (MHSF)	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
6.25%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
12.50%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
25%	A	5	5	4	
	B	5	5	4	
	C	5	4	4	
	D	5	4	3	
50%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	
100%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	

ALS Sample ID # 1208113-03
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50:	29.730%
Calculation Method:	Spearman-Kärber
Lower Confidence Limit:	25.996%
Upper Confidence Limit:	34.001%
Acute Toxic Unit (TU):	3.36

MISCELLANEOUS

Was organism stress observed during test:	No
Were any test chamber aerated during test:	No
Other:	

Comments:

Sample temperature upon arrival at laboratory was 0°C.

SAMPLE CHECK-IN

Sample ID Number

Arrival Date/Time: 8-16-12 / 8:20
 Sampling Date/Time: 8-15-12 /

1208113-3

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: 0°C Cooler
 Arrival Temperature: _____
 Sample Description: WWTP #3
 Analysis Requested: Acute C. dubia + P. promelas

Visual Inspection: Color Clear Odor yes Particulates yes (white debris)
 Comments: _____

Water Chemistry Analysis:
 Temperature: 10.4 °C D.O.: 5.59 mgO₂/L
 pH: 7.47 SU Alkalinity: 72 mg CaCO₃/L
 Conductivity: 13010 uS Hardness: 1308 mg CaCO₃/L
 Chlorine: 0.05 mg/L Salinity: 10.7 %

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 13:10

Bioassay Work Assignment Sheet

Work Description: Acute *C. dubia*
Assigned to: MLH

Work Order Number: 1460
Client: Nuclear Fuel Serv.
Sample ID Number: 1208113-3

Test Conditions:

Static/Renewal/ Flow Through:

Test Duration: 24 Hours

Acute
48 Hours

Chronic

96 Hours

7 Days

Dilution Water:

EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 -> 6.25 by 0.5

Replicates: 4

Test Temperature: 25° ± 1°c

Organism: P. promelas D. magna D. pulex C. dubia Other

Organism Age at Start of Test: <24hrs

Batch Number: CDMC 20 all gravid adults as of 8-15-12 @ 18:27

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 13:30
Completion Date/Time: 8-18-12 12:30
Assigned By: RLK

Date: 08/16/12

Standard Environmental

Work Order #: 1460

Lab #: 1208113-3

Client: Nuclear Fuel Serv.

Species: Ceriodaphnia dubia

Age: 24 hrs Batch: CDMC20

LC50: 29.730%

Method: Spaceman-Karber

Test Initiation: 8-10-12 13:30

Test Completion: 8-18-12 12:30

Conc	Control (MHSF)				
	Batch #: <u>281212</u>				
0	5	5	5	5	5
24	5	5	5	5	5
48	5	5	5	5	5

Conc	6.25	12.50	25	50	100	
0	5	5	5	5	5	MLH
24	5	5	5	0	0	MLH
48	5	5	4	3	1	MLH

Control	7.59	7.92	7.91
6.25	7.57	7.84	7.94
12.50	7.50	7.81	7.82
25	7.40	7.65	7.66
50	7.18	7.13	-
100	6.85	6.77	-
	MLH	MLH	MLH

	7.54	7.50	7.66
	7.87	7.73	7.89
	9.92	7.76	7.91
	7.92	7.72	7.84
	7.84	7.46	-
	7.59	7.23	-
	MLH	MLH	MLH

	306	312	312
	1770	1792	1809
	3190	3250	3220
	5130	5800	5710
	10280	10010	-
	18670	17890	-
	MLH	MLH	MLH

	24.6	25.9	25.9
	24.6	25.9	25.9
	24.8	25.8	25.8
	25.0	25.7	25.6
	25.1	25.6	-
	25.4	25.4	-
	MLH	MLH	MLH

	68		
	72		
	MLH	MLH	MLH

	84		
	1308		
	MLH	MLH	MLH

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 29.730
 95% LOWER CONFIDENCE: 25.996
 95% UPPER CONFIDENCE: 34.001

CONC. % Effluve	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	5.	25.00	.2069D+01
50.00	20.	20.	100.00	.9537D-04
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 50.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE

LEVEL ASSOCIATED WITH THESE LIMITS IS 97.9304 PERCENT.

AN APPROXIMATE LC50 FOR THIS DATA SET IS 30.125

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

DATE: 08/16/12 TEST NUMBER: 1460 DURATION: 48
 Hours
 SAMPLE: 1208113-03 SPECIES: C dubia

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	30.125	25.000	50.000	25.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	29.730	25.996	34.001	8.005

***** = LIMIT DOES NOT EXIST

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 3 Grab

ALS Sample ID #: 1208113-03
Work Order #: 1459
Date Sampled: 08/15/12 **Time Sampled:** 06:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours
Test Organism: **Common Name:** Fathead Minnow
Scientific Name: *Promelas pimephales*
Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 13:30
Test Termination Date: 08/18/12 **Test Termination Time:** 12:30

LC50 (% effluent): 44.646%
Survival in 100% effluent: 0%
Acute Toxic Unit (TUa): 2.24

ALS Sample ID # 1208113-03
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.4°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 35.35%

TEST ORGANISM DATA

Organism source: Aquatic BioSystems
 Organism age at start of test: 2 Days
 Batch #: pp376

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 2
 Number of test organisms per replicate: 10
 Volume of test solution: 200ml
 Test Chamber: 350ml Glass Chambers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-03
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.6°C	Dissolved Oxygen:	7.59mg/L
pH:	7.54SU	Alkalinity:	68mg/L
Conductivity:	306uS	Hardness:	84mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.4°C	Dissolved Oxygen:	6.85mg/L
pH:	7.59SU	Alkalinity:	72mg/L
Conductivity:	18670uS	Hardness:	1308mg/L
Chlorine	0.00mg/L	Salinity:	10.7%

ADJUSTMENTS: pH No pH adjustment required.
Chlorine No adjustment required.
Dissolved Oxygen No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-03
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	Hours		
			0	24	48
Control (MHSF)	A	10	10	10	
	B	10	10	10	
6.25%	A	10	10	10	
	B	10	10	9	
12.50%	A	10	10	10	
	B	10	10	10	
25%	A	10	10	10	
	B	10	10	10	
50%	A	10	8	4	
	B	10	7	3	
100%	A	10	0	0	
	B	10	0	0	

ALS Sample ID # 1208113-03
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50: 44.646%
Calculation Method: Spearman-Kärber
95% Confidence Interval (48hr):
Lower Confidence Limit: 38.268%
Upper Confidence Limit: 52.088%
Acute Toxic Unit (TU): 2.24

MISCELLANEOUS

Was organism stress observed during test: No
Were any test chamber aerated during test: No
Other:

Comments:

Sample temperature upon receipt was 0°C.

SAMPLE CHECK-IN

Sample ID Number

Arrival Date/Time: 8-16-12 / 8:20
 Sampling Date/Time: 8-15-12 /

1208113-3

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: 0°C Cooler
 Arrival Temperature: _____
 Sample Description: WWTF #3
 Analysis Requested: Acute C. dubia + P. promelas

Visual Inspection: Color Clear Odor yes Particulates yes (white debris)
 Comments: _____

Water Chemistry Analysis:

Temperature: 10.4 °C
 pH: 7.47 SU
 Conductivity: 13010 uS
 Chlorine: 0.05 mg/L

D.O.: 5.59 mgO₂/L
 Alkalinity: 72 mg CaCO₃/L
 Hardness: 1308 mg CaCO₃/L
 Salinity: 10.7 ‰

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 13:10

Bioassay Work Assignment Sheet

Work Description: Acute P. promelas

Work Order Number: 1459

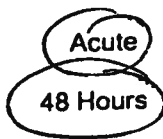
Client: Nuclear Fuel Serv.

Assigned to: MWH

Sample ID Number: 1208113-3

Test Conditions:

Static/Renewal/ Flow Through:



Chronic

Test Duration: 24 Hours

48 Hours

96 Hours

7 Days

Dilution Water:

EPA Moderately Hard Synthetic Freshwater

Batch #: 081212

Test Concentrations: 100 -> 6.25 by 0.5

Replicates: 2

Test Temperature: 25° ± 1°

Organism: P. promelas D. magna D. pulex C. dubia Other

Organism Age at Start of Test: 2 days

Batch Number: pp 376

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-10-12 @ 13:30

Completion Date/Time: 8-18-12 @ 12:30

Assigned By: rlk

Date: 08/16/12

Standard Environmental

Work Order #: 1459

Species: Pimephales promelas

Lab #: 1208113-3

Age: 2 days Batch: PP 376

Client: Nuclear Fuel Serv.

LC50: 44.646%

Test Initiation: 8-16-12 13:30

Method: Spearmen-Karber

Test Completion: 8-18-12 12:30

Conc	Control (MHSF)		
	Batch #: <u>081212</u>		
0	10	10	M/L/H
24	10	10	M/L/H
48	10	10	M/L/H

Conc	6.25	12.50	25	50	100
0	10	10	10	10	M/L/H
24	10	10	10	8	M/L/H
48	10	10	10	4	M/L/H

Control	6.25	12.50	25	50	100
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D.O. (mg/L)

7.59	7.92	7.50
7.57	7.84	7.35
7.50	7.81	7.20
7.40	7.65	7.05
7.18	7.13	5.96
6.85	5.61	-
M/L/H	M/L/H	M/L/H

pH (SU)

7.54	7.50	7.46
7.87	7.73	7.71
7.92	7.76	7.73
7.92	7.72	7.67
7.81	7.46	7.43
7.59	7.08	-
M/L/H	M/L/H	M/L/H

Conductivity (uS)

326	312	307
1770	1792	1803
3190	3250	3200
5730	5810	5640
10290	10100	10390
18670	17220	-
M/L/H	M/L/H	M/L/H

Temperature (°C)

24.6	25.9	25.9
24.6	25.9	25.9
24.8	25.9	25.9
26.0	25.9	25.9
25.1	25.9	25.9
25.4	25.9	-
M/L/H	M/L/H	M/L/H

Alkalinity

108
72
M/L/H

Hardness

84
1308
M/L/H

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: 1.67%
LC50: 44.646
95% LOWER CONFIDENCE: 38.268
95% UPPER CONFIDENCE: 52.088

CONC. % Efflu	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	1.	5.00	.2003D-02
12.50	20.	0.	.00	.9537D-04
25.00	20.	0.	.00	.9537D-04
50.00	20.	13.	65.00	.1316D+02
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 100.00 CAN BE USED AS STATISTICALLY

SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE

LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT.

AN APPROXIMATE LC50 FOR THIS DATA SET IS 44.233

THE MOVING AVERAGE METHOD CANNOT BE USED WITH THIS DATA SET BECAUSE NO SPAN WHICH PRODUCES AVERAGE ANGLES BRACKETING 45 DEGREES ALSO USES TWO PERCENT DEAD BETWEEN 0 AND 100 PERCENT.

NO CONVERGENCE IN 25 ITERATIONS. PROBIT METHOD PROBABLY CAN NOT BE USE WITH THIS SET OF DATA.

DATE: 08/16/12
SAMPLE: 1208113-03

TEST NUMBER: 1459
SPECIES: P promelas

DURATION: 48 Hours

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	44.233	25.000	100.000	75.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	44.646	38.268	52.088	13.819

NOTE: MORTALITY PROPORTIONS WERE NOT MONOTONICALLY INCREASING.
ADJUSTMENTS WERE MADE PRIOR TO SPEARMAN-KARBER ESTIMATION.

**** = LIMIT DOES NOT EXIST

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 4 Grab

ALS Sample ID #: 1208113-04
Work Order #: 1462

Date Sampled: 08/15/12 **Time Sampled:** 08:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours

Test Organism: **Common Name:** Water Flea
 Scientific Name: *Ceriodaphnia dubia*

Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 14:28
Test Termination Date: 08/18/12 **Test Termination Time:** 13:30

LC50 (%effluent): 27.739%
Survival in 100% effluent: 0%
Acute Toxic Unit (TU): 3.60

ALS Sample ID # 1208113-04
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.9°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations for ref tox: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 17.678%

TEST ORGANISM DATA

Organism source: In House
 Organism age at start of test: <24 Hours
 Batch #: CDMC20
 all gravid adults as of 08/15/12 18:27

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 4
 Number of test organisms per replicate: 5
 Volume of test solution: 40ml
 Test Chamber: 50ml Glass Beakers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-04
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.2°C	Dissolved Oxygen:	7.60mg/L
pH:	7.85SU	Alkalinity:	68mg/L
Conductivity:	312uS	Hardness:	84mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.5°C	Dissolved Oxygen:	6.88mg/L
pH:	7.63SU	Alkalinity:	52mg/L
Conductivity:	18830uS	Hardness:	1306mg/L
Chlorine	0.00mg/L	Salinity:	10.6%

ADJUSTMENTS:

pH	No pH adjustment required.
Chlorine	No adjustment required.
Dissolved Oxygen	No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-04
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:	Hours		
			0	24	48
Control (MHSF)	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
6.25%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
12.50%	A	5	5	5	
	B	5	5	5	
	C	5	5	5	
	D	5	5	5	
25%	A	5	5	4	
	B	5	3	3	
	C	5	4	3	
	D	5	3	3	
50%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	
100%	A	5	0	0	
	B	5	0	0	
	C	5	0	0	
	D	5	0	0	

ALS Sample ID # 1208113-04
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50: 27.739%
Calculation Method: Spearman-Kärber
Lower Confidence Limit: 23.927%
Upper Confidence Limit: 32.159%
Acute Toxic Unit (TU): 3.60

MISCELLANEOUS

Was organism stress observed during test: No
Were any test chamber aerated during test: No
Other:

Comments:

Sample temperature upon arrival at laboratory was 0°C.

SAMPLE CHECK-IN

Sample ID Number

1208113-4

Arrival Date/Time: 8-16-12 / 8:20
 Sampling Date/Time: 8-15-12 / 8:00

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: Cooler
 Arrival Temperature: 0°C
 Sample Description: WWTP #4
 Analysis Requested: Acute C. dubia + P. promelas

Visual Inspection: Color Clear Odor yes Particulates yes (white debris)
 Comments: _____

Water Chemistry Analysis:

Temperature: <u>9.4</u> °C	D.O.: <u>6.7</u> mgO ₂ /L
pH: <u>7.42</u> SU	Alkalinity: <u>52</u> mg CaCO ₃ /L
Conductivity: <u>12620</u> uS	Hardness: <u>1300</u> mg CaCO ₃ /L
Chlorine: <u>0.00</u> mg/L	Salinity: <u>10.10</u> ‰

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLH
Sample Clearly Labeled	✓		MLH
Arrived at or below 4°C	✓		MLH
Refrigerated Upon Arrival	✓		MLH

Additional Comments: _____

Check-in Completed by: MLH
 Date/Time: 8-16-12 / 14:00

Bioassay Work Assignment Sheet

Work Description: Acute C. dubia
Assigned to: MLH

Work Order Number: 1462
Client: Nuclear Fuel Serv.
Sample ID Number: 1208113-4

Test Conditions:

Static/Renewal/ Flow Through: Acute Chronic
Test Duration: 24 Hours 48 Hours 96 Hours 7 Days

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 -> 6.25 by 0.5

Replicates: 4

Test Temperature: 25 ± 1°C

Organism: *P. promelas* *D. magna* *D. pulex* *C. dubia* Other

Organism Age at Start of Test: < 24 hrs

Batch Number: CDMC 20 all gravid adults as of 8-15-12 @ 18:27

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 14:28
Completion Date/Time: 8-18-12 13:30
Assigned By: RLK

Date: 08/16/12

Work Order #: 1462
 Lab #: 1202113-4
 Client: Nuclear Fuel Serv.

Species: Ceriodaphnia dubia

Age: 24h Batch: CONC. 20

LC50: 27.73%
 Method: Sparrman-Karber

Test Initiation: 8-16-12 14:28
 Test Completion: 8-18-12 13:30

Conc	Control (MHSF)
0	5 5 5 5
24	5 5 5 5
48	5 5 5 5

Batch #: 081212

Conc	6.25	12.50	25	50	100
0	5 5 5 5	5 5 5 5	5 5 5 5	5 5 5 5	5 5 5 5
24	5 5 5 5	5 5 5 5	3 4 3 3	0 0 0 0	0 0 0 0
48	5 5 5 5	5 5 5 5	3 3 3 3	- - - -	- - - -

Control	6.25	12.50	25	50	100
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D.O. (mg/L)
7.60 8.06 7.80
7.49 8.00 7.72
7.41 7.96 7.64
7.24 7.69 7.45
7.14 7.20 -
6.88 6.90 -
MULT MULT MULT MULT MULT

pH (SU)
7.85 7.55 7.63
8.01 7.76 7.88
8.01 7.76 7.88
7.95 7.71 7.81
7.85 7.55 -
7.63 7.27 -
MULT MULT MULT MULT MULT

Conductivity (uS)
312 320 316
1840 1858 1839
3210 3310 3290
5280 5880 5890
10240 9860 -
18830 17860 -
MULT MULT MULT MULT MULT

Temperature (°C)
24.2 25.9 25.9
24.1 25.9 25.9
24.3 25.9 25.9
25.0 25.9 25.9
25.3 25.9 -
25.5 25.9 -
MULT MULT MULT MULT MULT

Alkalinity
68
52
MULT MULT

Hardness
84
1200
MULT MULT

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 27.739
 95% LOWER CONFIDENCE: 23.927
 95% UPPER CONFIDENCE: 32.159

CONC. % Efflun	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	7.	35.00	.1316D+02
50.00	20.	20.	100.00	.9537D-04
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 12.50 AND 50.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE

LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT.

AN APPROXIMATE LC50 FOR THIS DATA SET IS 28.259

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

DATE: 08/16/12 TEST NUMBER: 1462 DURATION: 48
 Hours 30.00
 SAMPLE: 1208113-04 SPECIES: C dubia

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
BINOMIAL	28.259	12.500	50.000	37.500
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	27.739	23.927	32.159	8.233

**** = LIMIT DOES NOT EXIST

ALS Environmental
1740 Union Carbide Drive
South Charleston, WV 25303
Phone: (304) 356-3168
Fax: (304) 204-6262
WV Laboratory Certification No. 006

**BIOMONITORING REPORT FORM
FRESH WATER ACUTE BIOASSAY**

Facility Name: Nuclear Fuel Services, Inc.
Facility Address: 1205 Banner Hill Road
Erwin, TN 37650

Facility Contact: Carol Hale
Telephone Number: (423) 743-9141

Sample Description: No. 4 Grab

ALS Sample ID #: 1208113-04
Work Order #: 1461
Date Sampled: 08/15/12 **Time Sampled:** 08:00
Date Received: 08/16/12 **Time Received:** 08:21
Date Reported: 08/28/12

BIOASSAY SPECIFICATIONS

Effluent Type(Final, Prechlorinated, Stormwater): Final
Test Type (Static or Renewal): Static
Test Duration (hours): 48 Hours
Test Organism: **Common Name:** Fathead Minnow
Scientific Name: *Promelas pimephales*
Test Endpoint: LC50

FINAL RESULT SUMMARY

Test Initiation Date: 08/16/12 **Test Initiation Time:** 14:28
Test Termination Date: 08/18/12 **Test Termination Time:** 13:30

LC50 (% effluent): 57.435%
Survival in 100% effluent: 0%
Acute Toxic Unit (TUa): 1.74

ALS Sample ID # 1208113-04
 Facility: Nuclear Fuel Services, Inc.

QUALITY CONTROL SUMMARY

Control Survival (%): 100%
 Test Temperature Maintained: 25 ± 1 C
 Test Temperature Range: 24.7°C - 25.4°C
 Test Temperature Mean: 25.0°C
 Dissolved Oxygen Maintained at or above minimum: Yes
 Loading Factor at or less than maximum allowable: Yes
 Two or more trend deviations: No
 Most Recent Reference Toxicant Test Date: 07/17/12
 Most Recent Reference Toxicant Test Result (LC50): 35.35%

TEST ORGANISM DATA

Organism source: Aquatic BioSystems
 Organism age at start of test: 2 Days
 Batch #: pp376

TEST DESIGN

Number of effluent test concentrations: 5
 Test concentrations (% of effluent): 6.25%, 12.50%, 25%, 50%, 100%
 Number of replicates per concentration: 2
 Number of test organisms per replicate: 10
 Volume of test solution: 200ml
 Test Chamber: 350ml Glass Chambers
 Feeding Schedule: Prior to test
 Photoperiod: 16 Hr light / 8 Hr dark
 Incubator ID: Testing #1

Concentration (%)	Diluent (MHSF) (ml)	Effluent (ml)	Total Vol (ml)
Control	1000	0	1000
6.25%	937.5	62.5	1000
12.50%	875	125	1000
25%	750	250	1000
50%	500	500	1000
100%	0	1000	1000

ALS Sample ID # 1208113-04
Facility: Nuclear Fuel Services, Inc.

DILUTION WATER

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Preparation Date: 08/12/12
Batch #: 081212

WATER CHEMISTRY - DILUTION WATER

Temperature:	24.2°C	Dissolved Oxygen:	7.60mg/L
pH:	7.85SU	Alkalinity:	68mg/L
Conductivity:	312uS	Hardness:	84mg/L
Chlorine	0.00mg/L	Salinity:	0.1%

WATER CHEMISTRY - SAMPLE

Temperature:	25.5°C	Dissolved Oxygen:	6.88mg/L
pH:	7.63SU	Alkalinity:	52mg/L
Conductivity:	18830uS	Hardness:	1306mg/L
Chlorine	0.00mg/L	Salinity:	10.6%

ADJUSTMENTS: pH No pH adjustment required.
Chlorine No adjustment required.
Dissolved Oxygen No aeration required.

SAMPLE CHARACTERISTICS

Clarity:	Clear	Sediment:	Yes, white
Color:	None	Particulate:	Yes, white
Odor:	Yes	Other:	None

Acclimation Procedure: Sample was warmed to 25°C in a hot water bath prior to testing.

ALS Sample ID #
Facility:

1208113-04
Nuclear Fuel Services, Inc.

SURVIVAL DATA

Test Concentration: % EFFLUENT		Exposure Time:		
		0	<u>24</u>	48
Control (MHSF)	A	10	10	10
	B	10	10	10
6.25%	A	10	10	10
	B	10	10	10
12.50%	A	10	10	10
	B	10	10	10
25%	A	10	10	10
	B	10	10	10
50%	A	10	9	7
	B	10	10	7
100%	A	10	0	0
	B	10	0	0

ALS Sample ID # 1208113-04
Facility: Nuclear Fuel Services, Inc.

BIOASSAY RESULTS

LC50:	57.435%
Calculation Method:	Spearman-Kärber
95% Confidence Interval (48hr):	
Lower Confidence Limit:	49.859%
Upper Confidence Limit:	66.202%
Acute Toxic Unit (TU):	1.74

MISCELLANEOUS

Was organism stress observed during test:	No
Were any test chamber aerated during test:	No
Other:	

Comments:

Sample temperature upon receipt was 0°C.

SAMPLE CHECK-IN

Sample ID Number

1208113-4

Arrival Date/Time: 8-16-12 / 8:20
 Sampling Date/Time: 8-15-12 / 8:00

Shipper: Federal Express UPS _____ Other _____
 Storage While Shipped: Cooler
 Arrival Temperature: 0°C
 Sample Description: WWTP #4
 Analysis Requested: Acute S. dubia + P. promelas

Visual Inspection: Color clear ~~blue~~ Odor yes Particulates yes (white debris)
 Comments: _____

Water Chemistry Analysis:

Temperature: 9.4 °C
 pH: 7.42 SU
 Conductivity: 12620 uS
 Chlorine: 0.00 mg/L

D.O.: 6.17 mg O₂/L
 Alkalinity: 52 mg CaCO₃/L
 Hardness: 1300 mg CaCO₃/L
 Salinity: 10.6 ‰

QA/QC

	YES	NO	INITIALS
Chain-of-Custody Complete	✓		MLK
Sample Clearly Labeled	✓		MLK
Arrived at or below 4°C	✓		MLK
Refrigerated Upon Arrival	✓		MLK

Additional Comments: _____

Check-in Completed by: MLK
 Date/Time: 8-16-12 / 14:00

Bioassay Work Assignment Sheet

Work Description: Acute P.promelas Work Order Number: 1461
Assigned to: MLH Client: Nuclear Fuel Serv.
Sample ID Number: 1208113-4

Test Conditions:

Static/Renewal/ Flow Through: Acute Chronic
Test Duration: 24 Hours 48 Hours 96 Hours 7 Days

Dilution Water: EPA Moderately Hard Synthetic Freshwater
Batch #: 081212

Test Concentrations: 100 -> 6.25 by 0.5

Replicates: 2

Test Temperature: 25 ± 1°C

Organism: P. promelas D. magna D. pulex C. dubia Other

Organism Age at Start of Test: 2 days

Batch Number: PP 376

Feeding Regime: NA

Batch Number of Food: NA

Special Conditions:

Initiation Date/Time: 8-16-12 14:28
Completion Date/Time: 8-18-12 13:30
Assigned By: RLK

Date: 08/16/12

CT-TOX: BINOMIAL, MOVING AVERAGE, PROBIT, AND SPEARMAN METHODS

SPEARMAN-KARBER

TRIM: .00%
 LC50: 57.435
 95% LOWER CONFIDENCE: 49.829
 95% UPPER CONFIDENCE: 66.202

CONC. % Efflu	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (%)
6.25	20.	0.	.00	.9537D-04
12.50	20.	0.	.00	.9537D-04
25.00	20.	0.	.00	.9537D-04
50.00	20.	6.	30.00	.5766D+01
100.00	20.	20.	100.00	.9537D-04

THE BINOMIAL TEST SHOWS THAT 25.00 AND 100.00 CAN BE USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT CONFIDENCE LIMITS SINCE THE ACTUAL

CONFIDENCE LEVEL ASSOCIATED WITH THESE LIMITS IS 99.9998 PERCENT.
 AN APPROXIMATE LC50 FOR THIS DATA SET IS 58.425

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

DATE: 08/16/12 TEST NUMBER: 1461 DURATION: 48
 Hours
 SAMPLE: 1208113-04 SPECIES: P promelas

METHOD	LC50	CONFIDENCE LIMITS		
		LOWER	UPPER	SPAN
STATISTICALLY BINOMIAL	58.425	25.000	100.000	75.000
MAA	*****	*****	*****	*****
PROBIT	*****	*****	*****	*****
SPEARMAN	57.435	49.829	66.202	16.373

**** = LIMIT DOES NOT EXIST

ALS Group USA, Corp

Sample Receipt Checklist

Client Name: **NUCLEAR FUEL SERVICES, INC.**

Date/Time Received: **16-Aug-12 08:20**

Work Order: **1208113**

Received by: **JAS**

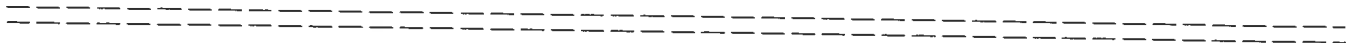
Checklist completed by Janet Smith 16-Aug-12
eSignature Date

Reviewed by: Rebecca Kiser 16-Aug-12
eSignature Date

Matrices: Water
Carrier name: FedEx

Shipping container/cooler in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on shipping container/cooler?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Custody seals intact on sample bottles?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Not Present <input type="checkbox"/>
Chain of custody present?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody signed when relinquished and received?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Chain of custody agrees with sample labels?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Samples in proper container/bottle?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sample containers intact?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Sufficient sample volume for indicated test?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
All samples received within holding time?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Container/Temp Blank temperature in compliance?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	
Temperature(s)/Thermometer(s):	<u>1C and 0C</u>		
Cooler(s)/Kit(s):			
Water - VOA vials have zero headspace?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	No VOA vials submitted <input checked="" type="checkbox"/>
Water - pH acceptable upon receipt?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
pH adjusted?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input checked="" type="checkbox"/>
pH adjusted by:			

Login Notes:



Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

[Empty text box for comments]

CorrectiveAction:

[Empty text box for corrective action]

