Nautilus Environmental, LLC

Dangerous Waste Characterization

Sample ID: Slag-02

Report date: May 7, 2008

Submitted to:

Clean Harbors Environmental Services
19320 Des Moines Memorial Drive
Seatac, WA 98148

Washington Laboratory
5009 Pacific Hwy East
Suite 2
Tacoma, WA 98424

1.0 INTRODUCTION

A dangerous waste characterization using the test organism *Oncorhynchus mykiss* (rainbow trout) was conducted on a sample submitted by Clean Harbors Environmental Services to Nautilus Environmental. Testing was conducted following the Washington State Department of Ecology Publication 80-12.

2.0 METHODS

The sample, identified as Slag-02, was received in the laboratory on April 30, 2008. Upon arrival at the laboratory the sample was inspected and contents verified against information provided on the chain-of-custody form. The sample was stored at 4°C in the dark until use. The test procedure is outlined in Table 1.

Table 1. Summary of Dangerous Waste Characterization Test Conditions

Parameter	Standard Fish Toxicity Test
Test number	0805-T002
Sample ID	Slag-02
Test initiation date; time	5/2/2008; 1300h
Test termination date; time	5/6/2008; 1400h
Endpoint	Mortality at 96-hours
Test chamber	8 L glass tank
Test temperature	12 ± 1°C
Dilution water	Carbon filtered water
Test solution volume	8 L
Test concentrations (mg/L)	100, 10, 0
Number of organisms/ chamber	10
Number of replicates	3
Test organism	*Oncorhynchus mykiss* (rainbow trout)
Feeding	No feeding during test
Photoperiod	16 hours light/ 8 hours dark
Extraction	Rotary agitation (30 +/- 2 rpm) for 18 hours
Reference Toxicant	Copper sulfate
Deviations	None

AKC-0019563

The test organisms used in the test are outlined in Table 2. The sample was tested using fish received on April 4, 2008.

Table 2. Test organisms (*Oncorhynchus mykiss*)

Test organism age	46 days post swim-up (hatch date 3/3/2008)
Mean weight	0.26 g
Mean length	29 mm
Ratio of longest to shortest	1.2
Loading	0.32 g/L
Test organism source	Thomas Fish; Anderson, CA

3.0 RESULTS

A summary of results for the dangerous waste characterization conducted on sample Slag-02 is contained in Table 3. There was no mortality during the test. Based on these results, the sample does not designate as either dangerous or extremely hazardous waste.

Table 3. Summary of Results

Sample ID	Concentration (mg/L)	Survival (# fish, N=30)	Percent Mortality	Dangerous Waste Designation
Control	0	30	0	NA
Slag-02	10 100	30 30	0 0	None

4.0 QUALITY ASSURANCE

A reference toxicant test is currently being conducted; results will be available upon request. The most recently completed reference toxicant test was initiated April 11, 2008. The LC_{50} of 45.22 µg/L copper fell within the acceptable range of mean ± two standard deviations of historical test results indicating that the test organisms were of an appropriate degree of sensitivity. The coefficient of variation (CV) for the last 20 tests was 36.3 percent, which is considered good by the Biomonitoring Science Advisory Board.

References

Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Washington State Department of Ecology Publication # WQ-R-95-80. Revised June 2005.

Biological Testing Methods 80-12 for the Designation of Dangerous Waste. Washington State Department of Ecology Publication #80-12. Revised June 1999.

Appendix A
Test Data

Dangerous Waste Toxicity Test

Toxicity Test Data Sheet - Washington Laboratory

Client: Clean Harbors Environmental Services

Sample ID: Slag - 02

Test # 0805-T002

Start Date & Time: 5/2/08 1300

End Date & Time: 5/6/08 1400

Test Organism: *Oncorhynchus mykiss*

Test Protocol: **Washington State Department of Ecology Publ. 80-12**

Rep	Conc.	Cont #	Number of Live Organisms 0	24	48	72	96	Dissolved Oxygen (mg/L) 0	24	48	72	96	pH (units) 0	24	48	72	96	Conductivity (umhos/cm) 0	24	48	72	96	Temperature (°C) 0	24	48	72	96	Percent Survival
1	Ø	2	10	10	10	10	10	8.7	9.5	9.4	9.6	9.8	7.40	7.45	7.47	7.43	7.36	90				87	13.0	12.2	12.5	12.2	12.4	100%
2		4	10	10	10	10	10	8.7	9.2	9.1	9.6	9.8	7.46	7.44	7.45	7.44	7.43	80				82						
3		9	10	10	10	10	10	8.6	9.4	9.3	9.7	9.8	7.45	7.48	7.51	7.46	7.46	82				84						
1	10ppm	12	10	10	10	10	10	8.4	9.1	9.4	9.4	9.6	7.46	7.43	7.45	7.45	7.46	75				77	12.2	12.2	12.2	11.6	12.0	100%
2		22	10	10	10	10	10	8.9	9.2	9.3	9.4	9.6	7.51	7.48	7.46	7.46	7.48	83				85						
3		20	10	10	10	10	10	8.9	9.4	9.4	9.5	9.8	7.54	7.48	7.47	7.48	7.48	81				82						
1	100ppm	3	10	10	10	10	10	8.7	9.6	9.5	9.7	9.9	7.53	7.51	7.49	7.51	7.49	81				83	12.8	12.8	12.6	11.9	12.1	100%
2		13	10	10	10	10	10	8.6	9.1	9.2	9.3	9.8	7.45	7.47	7.45	7.47	7.50	77				80						
3		6	10	10	10	10	10	8.8	9.3	9.2	9.5	9.6	[illegible]	7.46	7.45	7.47	7.50	83				85						
1													7.53															
2																												
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Technician Initials			BP	NW	NW	JS	BP	BP	NW	NW	JS	BP																

Sample	Alk. (init.)	Hard. (init.)	Alk. (fin.)	Hard. (fin.)	Chlorine
	(mg/L as CaCO3)				(mg/L Cl2)
Control	40	40	32	36	0.03
100ppm	44	36	36	36	

Animal Source: Thomas Fish

Date of Hatch: 3/3/08

Test Volume: 8L

Date Received: 4/4/08

Date of Swim up: 3/17/08

Weights (g): .27 .25 .38 .19 .31 .26 .34 .29 .14 .16 μ = .26

Lengths(mm): 29 29 31 27 30 30 31 30 26 26 μ = 29

Length max/min: 1.2

Loading: .32g/L

Nautilus Environmental
Washington Laboratory
5009 Pacific Hwy. E., Suite 2
Tacoma, WA 98424
253-922-4296

Sample Description:

Appendix B
Reference Toxicant Test
Control Chart and Statistical Summary

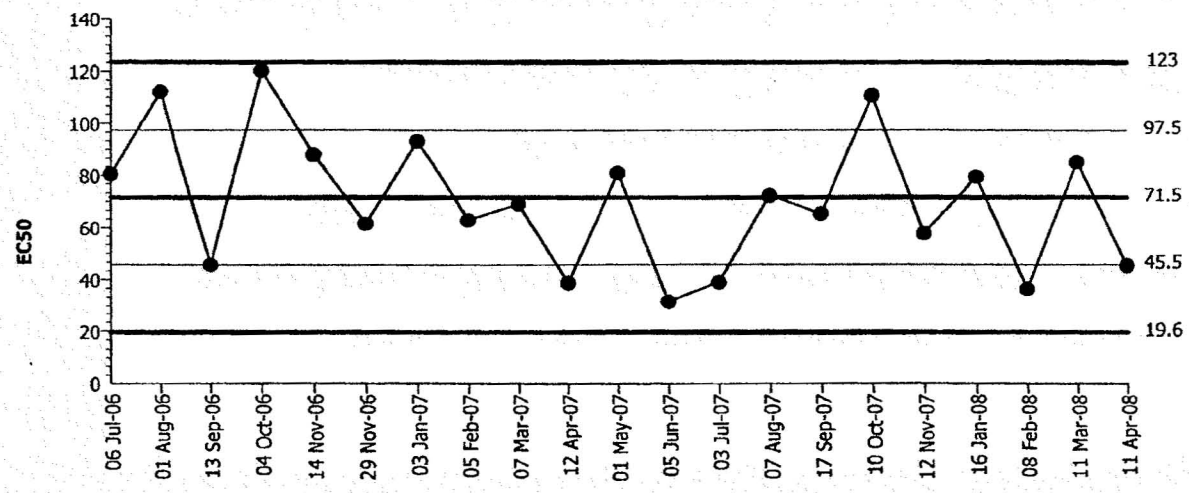
CETIS QC Plot

Report Date: 16 Apr-08 10:29 (1 of 1)

Acute Fish Survival Test — **Nautilus Environmental WA**

Test Type:	Survival (96h)	**Organism:**	Oncorhynchus mykiss (Rainbow Tro	**Material:**	Copper sulfate
Protocol:	EPA/821/R-02-012 (2002)	**Endpoint:**	96h Survival Rate	**Source:**	Reference Toxicant-REF

Acute Fish Survival Test



Mean:	71.51	**Count:**	20	**-1s Warning Limit:**	45.53	**-2s Action Limit:**	19.55
Sigma:	25.98	**CV:**	36.30%	**+1s Warning Limit:**	97.49	**+2s Action Limit:**	123.5

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Link No	Analysis No
1	2006	Jul	6	80.47	8.955	0.3447			08-0196-2782	16-9690-6989
2		Aug	1	112.2	40.74	1.568	(+)		08-6267-8343	09-7746-6681
3		Sep	13	45.65	-25.86	-0.9955			14-1862-0699	14-4190-4111
4		Oct	4	120.3	48.79	1.878	(+)		05-1640-1733	20-2095-2651
5		Nov	14	88.07	16.56	0.6373			11-2573-0594	06-3342-6879
6			29	61.56	-9.953	-0.3831			07-2713-6445	10-5454-1996
7	2007	Jan	3	93.3	21.79	0.8388			16-1383-8186	09-5460-8069
8		Feb	5	63	-8.514	-0.3277			02-4511-2417	08-3345-6600
9		Mar	7	69.1	-2.414	-0.09293			15-2742-2430	14-0632-0126
10		Apr	12	38.65	-32.86	-1.265	(-)		05-2221-9409	06-5376-8430
11		May	1	80.81	9.302	0.358			07-8440-9066	16-2412-3916
12		Jun	5	31.5	-40.01	-1.54	(-)		04-7226-1595	13-4878-0526
13		Jul	3	38.97	-32.54	-1.253	(-)		09-2201-9419	09-6463-0833
14		Aug	7	72.36	0.8535	0.03285			00-2704-2087	10-0764-4900
15		Sep	17	65.31	-6.198	-0.2386			09-6049-9537	19-0516-9479
16		Oct	10	110.9	39.38	1.516	(+)		07-7267-2112	10-4144-5232
17		Nov	12	57.43	-14.08	-0.5418			01-5405-3561	12-3986-4906
18	2008	Jan	16	79.37	7.86	0.3025			04-2972-7948	18-3406-5324
19		Feb	8	36.13	-35.38	-1.362	(-)		18-0745-0448	10-2659-0509
20		Mar	11	85.07	13.56	0.5218			01-5589-5982	15-0144-3175
21		Apr	11	45.22	-26.29	-1.012	(-)		09-9753-0098	10-2524-8126

CETIS Summary Report

Report Date: 16 Apr-08 10:31 (p 1 of 1)
Link/Link Code: 09-9753-0098/RA041108OM

Acute Fish Survival Test — **Nautilus Environmental WA**

Test Run No:	03-8844-0062	**Test Type:**	Survival (96h)	**Analyst:**	Mary Ann Rempel-Hester
Start Date:	11 Apr-08 11:20	**Protocol:**	EPA/821/R-02-012 (2002)	**Diluent:**	Dechlorinated Tap Water
Ending Date:	15 Apr-08 12:45	**Species:**	Oncorhynchus mykiss	**Brine:**	
Duration:	4d 1h	**Source:**	Thomas Fish Co.	**Age:**	39d

Sample No:	01-3271-1978	**Code:**	RA041108OM	**Client:**	Reference Toxicant Test
Sample Date:	16 Apr-08 10:21	**Material:**	Copper sulfate	**Project:**	
Receive Date:	16 Apr-08 10:21	**Source:**	Reference Toxicant		
Sample Age:	N/A	**Station:**			

Point Estimate Summary

Analysis No	Endpoint	Effect-%	Conc-µg/L	95% LCL	95% UCL	Method
10-2524-8126	96h Survival Rate	50	45.2	36.9	55.5	Trimmed Spearman-Kärber

Test Acceptability

Analysis No	Endpoint	Attribute	Test Stat	Acceptabilty Limits	Overlap	Decision
10-2524-8126	96h Survival Rate	Control Resp	1	0.9 - NL	Yes	Passes acceptability criteria

96h Survival Rate Summary

Conc-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	Diff%
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
25		3	0.83	0.753	0.907	0.6	1	0.0377	0.206	24.9%	17.0%
50		3	0.433	0.39	0.476	0.3	0.5	0.0211	0.115	26.6%	56.7%
100		3	0.1	0.1	0.1	0.1	0.1	0	0	0.0%	90.0%
200		3	0	0	0	0	0	0	0		100.0%
400		3	0	0	0	0	0	0	0		100.0%

96h Survival Rate Detail

Conc-µg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
25		1	0.889	0.6
50		0.5	0.5	0.3
100		0.1	0.1	0.1
200		0	0	0
400		0	0	0

Appendix C
Chain-of-Custody Form

NAUTILUS

CleanHarbors
ENVIRONMENTAL SERVICES®

CHAIN OF CUSTODY RECORD PAGE 1 OF 1

❑ 1 Hill Avenue, Braintree, MA 02184 Tel. (781) 849-1800
❑ 2202 Genoa Red Bluff Road, Houston, TX 77034 Tel. (281) 478-7700
❑ RTE. 2, Box 170, Waynoka, OK 73860 Tel. (580) 697-3500
❑ 5295 S. Garvey Road, Westmorland, CA 92281 Tel. (760) 344-9400
❑ 12400 247th Avenue SE, Sawyer, ND 58781 Tel. (701) 624-5622
❑ Other

Client: CLEAN HARBORS Project Name: ALASKAN COPPER Work Order/P.O. #: Date: 4/30/08

Report To: SCOTT ST. JOHN Address: ST.JOHN_SCOTT@CLEANHARBORS.COM Phone #: 425-501-4222

Sample I.D.	Sampling Information: Date	Time	Station Location	Sample Matrix	Analysis: FISH-BIO ASSAY	Dangerous waste characteristic NAK-OC									# of con.	CHES Sample #
SLAG-02	4/30	1000		SOLID	X											

Relinquished by Sampler: GSJ
Date: 4/30/08 Time: 1030

Received by: 4-30-08 CC
Date: Time: 1125

Relinquished by Sampler:
Date: Time: 1125

Received by:
Date: Time:

VOA Vial	
Glass Bottle	X
Plastic Bottle	
Preservation	
Volume	

DOT Shipping Name:

COMMENTS: (Fax Number, cautions, special instructions)

T08-071

Standard laboratory turnaround time is 1 week from date of receipt. Accelerated turnaround may be assessed a surcharge.

Location of samples:

Turnaround: 24 Hrs. 48 Hrs. 1 Week Other:

CH 119

LABORATORY COPY

AKC-0019572