MANITOBA HYDRO
BRANDON THERMAL GENERATING STATION:

CHARACTERIZATION OF ASH LAGOON EFFLUENT QUALITY AND TOXICITY

North/South Consultants Inc.
Aquatic Environment Specialists

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A Report Prepared for

Manitoba Hydro

by

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1.0 INTRODUCTION

This report presents the methods and results of two sampling programs conducted in September 2004 (by North/South Consultants Inc.) and January 2005 (by Manitoba Hydro) to characterize the Manitoba Hydro Brandon Thermal Generating Station Ash Lagoon effluent toxicity. The primary collective undertaking of these programs was to evaluate the acute and chronic toxicity of the ash lagoon effluent.

At Manitoba Hydro's request, North/South Consultants Inc. conducted a water quality sampling program at the Brandon Generating Station in September 2004 to evaluate the toxicity of effluent discharged from the station's ash lagoon. Additionally, to provide context for the interpretation of toxicity testing results, effluent quality was characterized for a suite of metals and routine water chemistry variables.

Water was also collected from the Assiniboine River a short distance upstream of the effluent outfall for toxicity testing and water quality analysis in September 2004, concurrent with collection of effluent samples. This facilitated characterization of the receiving environment, in terms of toxicity, prior to receipt of inputs from the ash lagoon effluent.

Manitoba Hydro collected samples of ash lagoon effluent in January 2005 for evaluation of acute and chronic toxicity at accredited laboratories.

A secondary objective of this study was to measure the concentrations of other metals in effluent and the Assiniboine River water that are not being analysed in the current monitoring program, as they are not stipulated in the Station's Environment Act Licence. While the provision of this information facilitates an initial evaluation of other 'potential contaminants of concern' in the effluent, it is strongly cautioned that the data are based on a single sample collected on a single day and are not necessarily representative of typical or extreme effluent conditions.

The following sections of this report provide brief descriptions of the methods employed for this study and a summary of the major results of this undertaking. A brief discussion of effluent quality and Assiniboine River water quality is provided in relation to the effluent discharge limits specified in the Station's Licence as well as to relevant Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs, Williamson 2002).

2.0 METHODS

2.1 SAMPLING SITES

Surface water samples were collected from the Assiniboine River upstream of the Brandon Thermal Generating Station (near the raw water intake) and from the ash lagoon effluent discharge weir on the 20 September, 2004 for chemical analysis by an accredited analytical laboratory. Water was also collected at each site for the conduct of a rainbow trout (*Oncorhynchus mykiss*) 96-hour acute toxicity test. *In situ* measurements of routine water quality parameters were recorded at both sites. All sample collection and handling was conducted by North/South Consultants Inc.

Additional toxicity testing was conducted on samples of ash lagoon effluent collected on January 04 and February 08, 2005 by Manitoba Hydro.

2.2 SAMPLE COLLECTION AND ANALYSIS

2.2.1 September 2004

In situ measurements of temperature, specific conductance, dissolved oxygen, pH, and turbidity were conducted at both sampling sites prior to the collection of surface water samples for laboratory analysis and toxicity tests. Dissolved oxygen was measured using a YSI Model 95 dissolved oxygen meter, temperature and conductivity were measured with a YSI Model 30 Handheld Salinity, Conductivity, and Temperature System, turbidity was measured using a HACH 2100P Turbidimeter, and pH was measured using an Accumet AP61 Portable pH Meter. All measurements were taken 10 cm below the water surface.

After the collection of *in situ* measurements, surface water samples were collected from each site for chemical analysis in the laboratory. Samples were collected in a 1L polyethylene bottle mounted at the end of an extension pole to prevent disturbance of the sediments during sampling. Each collection bottle was rinsed three times at each site using ambient water prior to sampling. Water samples were partitioned into laboratory-supplied, sampling bottles. Samples for the analysis of trace metals were preserved in the field by the addition of 5 mL of 20% nitric acid to a 500 mL sample volume. Immediately after collection, samples were stored on ice in the dark and delivered to Enviro-Test Laboratories (ETL) in Winnipeg within 6 hours of collection.

After collection of water samples for laboratory chemical analysis, approximately 60 L of water was collected for the conduct of a 96-hour acute toxicity test using rainbow trout. Plastic liners were inserted into the 20 L pails (provided by ETL) prior to sample collection. Samples were collected directly into each pail.

Laboratory analyses, and method references, conducted by Enviro-Test Laboratories in Winnipeg were:

- Total metals (low level scan) by ICP-MS: EPA 200.8 Rev. 5.4, May 1994.
- Extractable metals (low level scan) by ICP-MS: EPA 200.8, Rev. 5.4, May 1994.
- Dissolved Boron: EPA 200.8, Rev. 5.4, May 1994.
- Total dissolved solids: calculated.
- Total suspended solids (low range): APHA 2540.
- Hardness (as $CaCO_3$): calculated.
- Conductivity: APHA 4500B, 2510B, 2320B, 1998.
- pH: APHA 4500B, 2510B, 2320B, 1998.
- Alkalinity: APHA 4500B, 2510B, 2320B, 1998.
- Soluble sulphate by turbimetric analysis: APHA 4500; 1998/LACHAT; MAR 1997.
- Soluble chloride: APHA 4500; 1998/LACHAT; MAR 1997.
- Total phosphorus: APHA 1998.
- Nitrate + nitrite-nitrogen (soluble): APHA 4500; 1998/LACHAT; MAR 1997.

Detailed descriptions of the methods are provided in the analytical reports from ETL and presented in Appendix 1.

Dissolved reactive chlorine was measured by the Manitoba Hydro Brandon GS laboratory.

Static 96-hour rainbow trout acute LC50 toxicity tests were conducted on samples of Assiniboine River water and ash lagoon effluent at ETL in Winnipeg, according to Environment Canada reference method EPS1/RM/13, 2nd Ed., Dec. 2000.

2.2.2 January and February 2005

Effluent was collected on January 04 and February 08, 2005 in 20-L polyethylene pails with liners provided by ETL. Samples were submitted within 48 hours of collection to ETL, Winnipeg, MB for conduct of acute (pass/fail) 96-hour rainbow trout bioassays. The assay was conducted according to the Environment Canada reference method EPS1/RM/13, 2nd Ed., Dec. 2000.

Additionally, a sample of effluent was collected on January 04, 2005 in 2, 20-L pails provided by HydroQual Laboratories Ltd., and shipped to Enviro-Test Laboratories in Winnipeg, MB. ETL subsequently shipped the sample to HydroQual Laboratories, Calgary, AB for chronic toxicity testing using an algal species, an invertebrate species, and a fish species (these tests are not conducted by ETL). Bioassays included:

- 72-hour algal growth inhibition test, using *Raphidocelis subcapitata*. Biological Test Method: Growth inhibition test using the freshwater alga *Selenastrum carpicornutum*, 1992. Environment Canada, EPS 1/RM/25 (amended November 1997);

- *Ceriodaphnia* survival and reproduction test (five treatments plus a control). Biological Test Method: Test of reproduction and survival using the cladoceran *Ceriodaphnia dubia*. 1992. Environment Canada, EPS 1/RM/21 (amended November 1997); and,

- 7-day fathead minnow (*Pimephales promelas*) survival and growth test (five treatments plus a control). Biological Test Method: Test of larval growth and survival using fathead minnow. 1992. Environment Canada, EPS 1/RM/22 (amended November 1997).

2.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

2.3.1 September 2005

Standard field collection procedures were followed to avoid sample contamination and to provide for rigorous QA/QC, including the following:

- Samples were collected from the Assiniboine River prior to sampling the effluent (to avoid cross-contamination);
- Latex gloves were used throughout the collection process avoiding contact with the interiors of sampling containers and lids;
- All sample bottles provided by the analytical laboratory were rinsed three times with ambient water prior to filling (except those bottles already containing preservatives);
- Preservatives were added to samples immediately after sample collection;
- Samples were kept cool and in the dark, immediately following sample collection; and,
- Equipment used to collect water samples was rinsed in ambient water at each site prior to sample collection.

In addition, a field blank was prepared at the site by filling sample bottles with deionized water provided by ETL. The sample bottles were labelled with a blind code (so the analytical laboratory was not aware that it was a blank sample), the bottles were rinsed three times with deionized water, filled with deionized water, and preserved (where applicable). The field blanks were kept cool and in the dark and submitted to ETL for analysis along with river and effluent samples.

2.4 DATA ANALYSIS

Effluent quality and Assiniboine River water quality were compared to MWQSOGs, effluent limits in the Licence, and Environment Canada Effluent Guidelines.

3.0 RESULTS AND DISCUSSION

The following provides a brief discussion of the results of effluent quality characterization and toxicity testing results, based on samples collected from the Brandon GS on September 20, 2004. For context, effluent and Assiniboine River water quality results are compared to MWQSOGs, Licence limits, and Environment Canada effluent standards.

3.1 ACUTE TOXICITY BIOASSAYS

Three rainbow trout acute toxicity tests were conducted on effluent sampled on September 20, 2004, January 04, and February 08, 2005. In September, a 96-hour LC50 test was conducted whereas in January and February 2005, only a pass/fail test was conducted.

Laboratory results of the rainbow trout 96-hour LC50 toxicity bioassay of ash lagoon effluent and Assiniboine River water collected in September 2004 are presented in Appendix 1. No sublethal biological effects or mortalities were observed for either effluent or river water samples.

Similarly, the rainbow trout toxicity tests conducted on effluent collected in January and February, 2005 indicated no sublethal effects of mortalities. ETL laboratory toxicity test reports are presented in Appendix 2.

3.2 CHRONIC TOXICITY BIOASSAYS

No significant effects were observed for the algal growth inhibition, the *Ceriodaphnia* survival and growth, and the fathead minnow survival and growth toxicity bioassays (Appendix 2).

3.3 ASSINIBOINE RIVER AND EFFLUENT CHEMISTRY

ETL laboratory reports detailing the results of analyses conducted on samples of Assiniboine River water (collected near the raw water intake site) upstream of the Brandon GS and of ash lagoon effluent in September 2004 are provided in Appendix 1. A summary of these data and Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs, Williamson 2002) for the same parameters are provided in Table 1. *In situ* water quality data are presented in Table 2. Licence limits for effluent discharge from the Brandon GS ash lagoon as well as Environment Canada effluent standards, and MWQSOGs for the protection of aquatic life for parameters for which effluent monitoring is required are presented in Table 3.

3.3.1 Comparison to Licence Limits and Environment Canada Effluent Standards

All parameters for which there are Licence specifications and/or for which there are limits cited in the Environment Canada Codes of Practice (Environment Canada 1986), were below the specified values in the effluent sampled on September 20, 2004.

3.3.2 Comparison to MWQSOGs

3.3.2.1 MWQSOGs for the Protection of Aquatic Life

The concentration of several effluent constituents exceeded the MWQSOGs for the protection of aquatic life including:

- Total and extractable phosphorus;
- Total and extractable aluminum;
- Total molybdenum; and,
- Total and extractable selenium.

Additionally, concentrations of thallium approached the guideline for the protection of aquatic life and exceedences of the guideline for silver could not be assessed as the analytical detection limits for extractable (0.0005 mg/L) and total (0.001) silver were above the MWQSOG of 0.0001 mg/L.

Of these above parameters, the following were also above MWQSOGs for the protection of aquatic life in the Assiniboine River:

- Total and extractable phosphorus; and,
- Total and extractable aluminum.

Total selenium in the Assiniboine River was at the guideline. However, for these three parameters, the effluent concentrations were higher than those measured in the river.

Additionally, total and extractable iron in the Assiniboine River exceeded the guideline (0.3 mg/L) but the concentration in the effluent was considerably lower than the river and well below the criterion. Therefore, the effluent had a slight ameliorative effect for this element, with respect to river water quality.

3.3.2.2 MWQSOGs for Drinking Water, Irrigation, Livestock and Recreation

A number of parameters in ash lagoon effluent on September 20, 2004 were above MWQSOGs for drinking water, irrigation, livestock and/or recreation, including:

- pH (aesthetic drinking water guideline);
- Total dissolved solids (drinking water aesthetic guideline, irrigation);
- Conductivity (irrigation);
- Soluble sulphate (aesthetic drinking water guideline);
- Total and extractable arsenic (drinking water, livestock);
- Total, extractable, and dissolved boron (irrigation);
- Total and extractable molybdenum (irrigation);
- Total sodium (aesthetic drinking water guideline); and,
- Total and extractable selenium (drinking water, irrigation).

Of these parameters, only TDS (aesthetic drinking water guideline) in the Assiniboine River also exceeded MWQSOGs. However, the concentration in ash lagoon effluent (1,010 mg/L) was notably higher than in the river (568 mg/L). In addition, total and extractable iron and manganese in the river water exceeded the aesthetic drinking water quality guidelines while concentrations were substantively lower in the effluent and below MWQSOGs.

3.4 QA/QC

Laboratory QA/QC information is provided in the analytical data reports issued by Enviro-test Laboratories and HydroQual Laboratories and presented in Appendices 1 and 2.

Results of the field blank for the program were acceptable (measured values for each parameter were ≤5 times the respective analytical detection limits), indicating that sample contamination was not an issue (Table 4).

4.0 LITERATURE CITED

CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT. (CCME). 1999. Canadian environmental quality guidelines. Canadian Council of Ministers of the Environment, Winnipeg.

ENVIRONMENT CANADA. 1986. Environmental codes of practice for steam electric power generation – design phase. Report EPS 1 /PG/1.

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TABLES

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Table 1. Water quality analytical results reported by Enviro-Test Laboratories (Winnipeg, MB) for samples of Assiniboine River water and Brandon Ash Lagoon Effluent and Manitoba Water Quality Standards, Objectives, and Guidelines (MWQSOGs, Williamson 2002). All samples collected on September 20, 2004. MAC = maximum acceptable concentration; IMAC = interim maximum acceptable concentration.

Parameter		Unit	Assiniboine River at the water intake AR-2	Brandon GS Ash Lagoon Effluent Outfall BGS-EF	MWQSOGs						
					Aquatic Life Guideline or Objective[1]	Drinking Water			Irrigation	Livestock	Recreation
						MAC	IMAC	Aesthetic			
Alkalinity	Total (as $CaCO_3$)	mg/L	237	208							
	Bicarbonate (HCO_3)	mg/L	270	198							
	Carbonate (CO_3)	mg/L	9.3	27.4							
	Hydroxide (OH)	mg/L	<0.4	<0.4							
Routine	pH	pH units	8.40	8.86	6.5-9			6.5-8.5			5-9
	TDS (Calculated)	mg/L	568	1010				500	700-1000	3000	
	Hardness (as $CaCO_3$)	mg/L	328	334							
	Conductivity	umhos/cm	898	1530					1000-1500		
	Nitrate+Nitrite-N	mg/L	0.1	0.1	2.93[2]	10				100	
	Total Phosphorus	mg/L	0.086	0.101	0.05[3]						
	Total Suspended Solids	mg/L	28	5							
	Soluble Chloride	mg/L	29	39				250	100-700		
	Soluble Sulphate	mg/L	218	538				500		1000	

[1] Refers to water quality guidelines or chronic water quality objectives for the protection of aquatic life. For metals and metalloids, guidelines and objectives refer to total metals/metalloids.
[2] Refers to the CCME (1999, revision 2003) guideline for nitrate-nitrogen for the protection of aquatic life.
[3] Narrative guideline for streams for the prevention of nuisance growth and reproduction of aquatic plants or algae.

Table 1. - continued -

Parameter		Unit	Assiniboine River at the water intake	Brandon GS Ash Lagoon Effluent Outfall	MWQSOGs						
			AR-2	BGS-EF	Aquatic Life Guideline or Objective[1]	Drinking Water			Irrigation	Livestock	Recreation
						MAC	IMAC	Aesthetic			
Aluminum	Extractable	mg/L	0.10	0.98	0.005-0.1				5	5	
	Total	mg/L	1.44	1.16							
Antimony	Extractable	mg/L	<0.001	0.002			0.006				
	Total	mg/L	<0.001	0.002							
Arsenic	Extractable	mg/L	0.0056	0.0561	0.15		0.025		0.1	0.025	
	Total	mg/L	0.0056	0.0567							
Barium	Extractable	mg/L	0.0525	0.418			1				
	Total	mg/L	0.0633	0.4600							
Beryllium	Extractable	mg/L	<0.001	<0.001					0.1	0.1	
	Total	mg/L	<0.001	<0.001							
Bismuth	Extractable	mg/L	<0.0001	<0.0001							
	Total	mg/L	<0.0001	<0.0001							
Boron	Extractable	mg/L	0.139	0.88			5		0.5-6	5	
	Total	mg/L	0.15	0.97							
	Dissolved	mg/L	0.131	0.859							
Calcium	Extractable	mg/L	66.1	67.2						1000	
	Total	mg/L	75.6	85.8							

Table 1. - continued -

Parameter		Unit	Assiniboine River at the water intake AR-2	Brandon GS Ash Lagoon Effluent Outfall BGS-EF	MWQSOGs						
					Aquatic Life Guideline or Objective[1]	Drinking Water			Irrigation	Livestock	Recreation
						MAC	IMAC	Aesthetic			
Cadmium	Extractable	mg/L	<0.0002	<0.0002	0.0063-0.0064[4]	0.005			0.0051	0.08	
	Total	mg/L	<0.0002	<0.0002							
Cobalt	Extractable	mg/L	0.0005	0.0004					0.05	1	
	Total	mg/L	0.0007	0.0005							
Chromium	Extractable	mg/L	<0.001	0.020	0.228-0.231[4]				0.0049	0.05	
	Total	mg/L	0.002	0.023							
Cesium	Extractable	mg/L	<0.0001	0.003							
	Total	mg/L	0.0002	0.0031							
Copper	Extractable	mg/L	0.0024	0.0054	0.0257-0.0261[4]			1	0.2-1.0	0.5-5	
	Total	mg/L	0.004	0.007							
Iron	Extractable	mg/L	0.25	0.02	0.3			0.3	5		
	Total	mg/L	0.89	<0.05							
Potassium	Extractable	mg/L	9.34	18.5							
	Total	mg/L	11.1	23.6							
Lithium	Extractable	mg/L	0.059	0.096					2.5		
	Total	mg/L	0.06	0.11							

[4] Site-specific objectives calculated from water hardness measured in the Assiniboine River and the effluent.

Table 1. - continued -

Parameter		Unit	Assiniboine River at the water intake AR-2	Brandon GS Ash Lagoon Effluent Outfall BGS-EF	MWQSOGs						
					Aquatic Life Guideline or Objective[1]	Drinking Water			Irrigation	Livestock	Recreation
						MAC	IMAC	Aesthetic			
Magnesium	Extractable	mg/L	39.6	40.4							
	Total	mg/L	44.3	48.6							
Manganese	Extractable	mg/L	0.088	0.0074				0.05	0.2		
	Total	mg/L	0.0967	0.0083							
Molybdenum	Extractable	mg/L	0.0027	0.0704	0.073				0.01-0.05	0.5	
	Total	mg/L	0.0031	0.0740							
Sodium	Extractable	mg/L	63.5	180				200			
	Total	mg/L	71.8	221							
Nickel	Extractable	mg/L	0.0032	0.0030	0.143-0.145 [4]				0.2	1	
	Total	mg/L	0.006	0.005							
Phosphorus	Extractable	mg/L	0.08	0.11	0.05						
	Total	mg/L	0.11	0.10							
Lead	Extractable	mg/L	0.0005	0.0002	0.0144-0.0148 [4]	0.01			0.2	0.1	
	Total	mg/L	0.0007	<0.0005							
Rubidium	Extractable	mg/L	0.0019	0.0261							
	Total	mg/L	0.0038	0.0268							
Selenium	Extractable	mg/L	<0.001	0.039	0.001	0.01			0.02-0.05	0.05	
	Total	mg/L	0.001	0.038							

Table 1. - continued -

Parameter		Unit	Assiniboine River at the water intake	Brandon GS Ash Lagoon Effluent Outfall	MWQSOGs						
			AR-2	BGS-EF	Aquatic Life Guideline or Objective[1]	Drinking Water			Irrigation	Livestock	Recreation
						MAC	IMAC	Aesthetic			
Silicon	Extractable	mg/L	5.3	4.6							
Silver	Extractable	mg/L	<0.0005	<0.0005	0.0001						
	Total	mg/L	<0.001	<0.001							
Strontium	Extractable	mg/L	0.334	2.49							
	Total	mg/L	0.333	2.55							
Tellurium	Extractable	mg/L	<0.0005	<0.0005							
	Total	mg/L	<0.001	<0.001							
Thallium	Extractable	mg/L	0.0001	0.0007	0.0008						
	Total	mg/L	<0.0001	0.0006							
Tin	Extractable	mg/L	<0.0002	<0.0002							
	Total	mg/L	<0.0005	<0.0005							
Titanium	Extractable	mg/L	0.002	0.0149							
	Total	mg/L	0.0292	0.0208							
Uranium	Extractable	mg/L	0.0023	0.0034			0.02		0.01	0.2	
	Total	mg/L	0.0027	0.0039							
Vanadium	Extractable	mg/L	0.004	0.087					0.1	0.1	
	Total	mg/L	0.007	0.096							

Table 1. - continued -

Parameter		Unit	Assiniboine River at the water intake AR-2	Brandon GS Ash Lagoon Effluent Outfall BGS-EF	MWQSOGs						
					Aquatic Life Guideline or Objective[1]	Drinking Water			Irrigation	Livestock	Recreation
						MAC	IMAC	Aesthetic			
Tungsten	Extractable	mg/L	<0.0002	0.0029							
	Total	mg/L	<0.0002	0.0026							
Zinc	Extractable	mg/L	0.012	<0.005	0.328-0.333[4]			5	1-5	50	
	Total	mg/L	0.01	<0.01							
Zirconium	Extractable	mg/L	<0.0004	<0.0004							
	Total	mg/L	0.0012	0.0006							
	Total reactive chlorine[5]	mg/L	0.02	0.02							

[5] Measured by the Manitoba Hydro Brandon Thermal Generating Station analytical laboratory.

Table 2. *In situ* measurements recorded at in the Assiniboine River at the raw water intake site (AR-2) and in the Brandon GS Ash Lagoon effluent discharge channel (BGS-EF) on 20 September, 2004.

Location	**AR-2 (at raw water intake)**	**BGS-EF (effluent channel)**
Dissolved oxygen (mg/L)	19.02	20.32
pH	8.50	8.98
Turbidity (NTU)	26.1	5.0
Conductivity (µS/cm)	897	1523
Temperature	17.9	19.0

Table 3. Brandon GS Environmental Licence 1703 R (Revised February 14, 1994) effluent discharge limits, Environment Canada Environmental Codes of Practice (Environment Canada 1986), and Manitoba Water Quality Standards, Objectives and Guidelines (MWQSOGs) for the protection of aquatic life (Williamson 2002).

Parameter	Unit	Licence Specifications	Environment Canada Environmental Codes of Practice Effluent Guidelines	MWQSOGs (mg/L) (Williamson 2002) For the Protection of Aquatic Life (chronic)
pH	-	6.5-9.0	6.5 – 9.5	6.5-9.0
Total dissolved solids	mg/L	-	-	-
Suspended solids	mg/L	<25 mg/L above TSS in the Assiniboine River	25 mg/L	25 (or 10%) above background
Hardness (as $CaCO_3$)	mg/L	-	-	-
Sulphates (as SO_4)	mg/L	-	-	
Total phosphorus	mg/L	-	-	0.025 (streams)
Total iron	mg/L	-	1.000 mg/L	0.3 mg/L
Total chlorine residual	mg/L	0.2 mg/L	0.2 mg/L	0.011 (chronic); 0.019 (acute) as reactive chlorine species
Soluble boron	mg/L	-	-	-
Acid-soluble arsenic	mg/L	-	-	0.150 (chronic); 0.340 (acute) for total dissolved arsenic
Acid-soluble copper	mg/L	-	0.5 mg/L (total copper)	Calculated from water hardness (as total or dissolved copper)
Acid-soluble lead	mg/L	-	-	Calculated from water hardness (as total or dissolved lead)
Total zinc	mg/L	-	0.5 mg/L	Calculated from water hardness (as total or dissolved zinc)
Acid-soluble cadmium	mg/L	-	-	Calculated from water hardness (as total or dissolved cadmium)
Total selenium	mg/L	-	-	0.001

Table 4. Results of a quality control field blank sample prepared during the conduct of the field sampling, September 20, 2004.

Parameter		Unit	Field Blank AR-1	Analytical Detection Limits
Alkalinity	Total (as $CaCO_3$)	mg/L	2	1
	Bicarbonate (HCO_3)	mg/L	2	2
	Carbonate (CO_3)	mg/L	<0.6	0.6
	Hydroxide (OH)	mg/L	<0.4	0.4
pH	PH	pH units	6.06	0.01
	TDS (Calculated)	mg/L	1	
	Hardness (as $CaCO_3$)	mg/L	<1	
	Conductivity	umhos/cm	0.5	0.4
	Nitrate+Nitrite-N	mg/L	<0.01	0.01
	Total Phosphorous	mg/L	0.005	0.001
	Total Suspended Solids	mg/L	<2	2
	Soluble Chloride	mg/L	<9	9
	Soluble Sulphate	mg/L	<9	9
Aluminum	Extractable	mg/L	0.01	0.01
	Total	mg/L	0.03	0.02
Antimony	Extractable	mg/L	<0.001	0.001
	Total	mg/L	<0.001	0.001
Arsenic	Extractable	mg/L	<0.0005	0.0005
	Total	mg/L	<0.0005	0.0005
Barium	Extractable	mg/L	<0.0003	0.0003
	Total	mg/L	0.0004	0.0003
Beryllium	Extractable	mg/L	<0.001	0.001
	Total	mg/L	<0.001	0.001
Bismuth	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	<0.0001	0.0001
Boron	Extractable	mg/L	<0.009	0.009
	Total	mg/L	<0.03	0.03
	Dissolved	mg/L	<0.009	0.009
Calcium	Extractable	mg/L	<0.05	0.05
	Total	mg/L	0.1	0.1

Table 4. - continued -

Parameter		Unit	Field Blank AR-1	Analytical Detection Limits
Cadmium	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	<0.0002	0.0002
Cobalt	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	<0.0002	0.0002
Chromium	Extractable	mg/L	<0.001	0.001
	Total	mg/L	0.001	0.001
Cesium	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	<0.0001	0.0001
Copper	Extractable	mg/L	<0.0004	0.0004
	Total	mg/L	0.001	0.001
Iron	Extractable	mg/L	<0.01	0.01
	Total	mg/L	0.07	0.05
Potassium	Extractable	mg/L	<0.05	0.05
	Total	mg/L	<0.1	0.1
Lithium	Extractable	mg/L	<0.005	0.005
	Total	mg/L	<0.01	0.01
Magnesium	Extractable	mg/L	<0.01	0.01
	Total	mg/L	0.01	0.01
Manganese	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	0.0004	0.0003
Molybdenum	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	<0.0002	0.0002
Sodium	Extractable	mg/L	<0.02	0.02
	Total	mg/L	0.04	0.02
Nickel	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	<0.002	0.002
Phosphorus	Extractable	mg/L	<0.02	0.02
	Total	mg/L	<0.05	0.05

Table 4. - continued -

Parameter		Unit	Field Blank AR-1	Analytical Detection Limits
Lead	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	<0.0005	0.0005
Rubidium	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	<0.0002	0.0002
Selenium	Extractable	mg/L	<0.001	0.001
	Total	mg/L	<0.001	0.001
Silicon	Extractable	mg/L	<0.2	0.2
Silver	Extractable	mg/L	<0.0005	0.0005
	Total	mg/L	<0.001	0.001
Strontium	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	0.0004	0.0001
Tellurium	Extractable	mg/L	<0.0005	0.0005
	Total	mg/L	<0.001	0.001
Thallium	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	<0.0001	0.0001
Tin	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	<0.0005	0.0005
Titanium	Extractable	mg/L	<0.0005	0.0005
	Total	mg/L	0.0012	0.0009
Uranium	Extractable	mg/L	<0.0001	0.0001
	Total	mg/L	<0.0001	0.0001
Vanadium	Extractable	mg/L	<0.001	0.001
	Total	mg/L	<0.001	0.001
Tungsten	Extractable	mg/L	<0.0002	0.0002
	Total	mg/L	<0.0002	0.0002
Zinc	Extractable	mg/L	<0.005	0.005
	Total	mg/L	<0.01	0.01
Zirconium	Extractable	mg/L	<0.0004	0.0004
	Total	mg/L	<0.0004	0.0004

APPENDIX 1. Enviro-Test Laboratories analytical laboratory test results, September 2004 sampling.

Rainbow Trout Bioassay Test Report – LC50

Sample Number: L208775-4

Summary Results

96-hour LC50 v/v (%):	>100
95% Lower Confidence Interval v/v (%):	NA
95% Upper Confidence Interval v/v (%):	NA
Method of Calculation:	NA
Confirmed by Graph:	NA

Sample Information

Sample Origin:	North/South Consultants
Sample Description:	AR-2
Sampling Date and Time:	04/09/20
Sampling Method:	Grab
Sampled By:	P.B.
Container(s) Description:	3 X 20 L Polyethylene pails w/liners
Sample Volume (L):	60 L
Date and Time Received:	04/09/21 08:00
Transit Irregularities:	None
Storage Temperature:	4

Test Information

Test Organism:	Oncorhynchus mykiss
Test Description:	Acute, 96-hour, Static, Pass/Fail
Reference Method:	EPS1/RM/13, 2nd Ed. Dec. 2000, Environment Canada
Performed By:	BJL
Starting Date & Time:	04/09/21 14:00
Source of Holding/Dilution Water:	Dechlorinated UV treated city of Winnipeg tap water
Container Description:	Polyethylene pails w/disposable liners
Test Solution Volume (L):	20 L
Test Solution Depth (cm):	34 cm
Number of Test Organisms/Container:	10
Deviations from Reference Method:	None

Enviro-Test Laboratories
745 Logan Ave
Winnipeg, MB R3E 3L5
(204) 945-3705

Condition of Sample Upon Arrival

Observations:

Colour:	Clear
Odour:	None
Turbidity:	None
Solids:	Small amount of sediment
Temperature (°C):	15.3
pH:	8.16
pH Adjustment:	Not Adjusted
Conductivity at 25°C (umhos/cm):	901
Dissolved Oxygen (mg/L):	10.62

Pre-Aeration

Duration at 6.5 – 7.0 mL/min/L (min):	120	
Sample Test Concentration (v/v):	100%	0%
Before Pre-Aeration Dissolved Oxygen (% sat.):	106.1	96.2
After Pre-Aeration Dissolved Oxygen (% sat.):	101.5	95.9

Test Organism Data

Lot Number:	040907-T1
Weekly Mortality Preceding Test (%):	<2
Average Fork Length +/- 1 SD (cm):	4.2
Average Mass +/- 1 SD (g):	0.56
Loading Density (organisms/20mL):	0.28

Reference Toxicant

Toxicant:	Zinc Sulphate
Test Starting Date:	04/09/07
96-hour LC50 (mg/L ZnSO4):	0.53
95% Lower Confidence Interval (mg/L ZnSO4):	0.46
95% Upper Confidence Interval (mg/L ZnSO4):	0.62
Method of Calculation:	Stephan LC50 Program, Probit
Confirmed by Graph:	Yes
Historic Geometric Mean LC50 (mg/L ZnSO4):	0.76
95% Lower Confidence Interval (mg/L ZnSO4):	0.10
95% Upper Confidence Interval (mg/L ZnSO4):	1.42

Test Data

Time: 0 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
Temperature (°C)	14.9	15.2	15.4	15.4	15.4	15.5
pH	8.18	8.08	8.02	7.77	7.69	7.44
Conductivity at 25 °C (umhos/cm)	901	551	348	266	208	160
Dissolved Oxygen (mg/L)	10.25	10.03	9.89	9.83	9.74	9.57

Time: 24 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Temperature (°C)	14.7	14.8	14.7	14.8	14.8	14.9
pH	9.98	9.99	10.26	9.90	9.93	9.64
Dissolved Oxygen (mg/L)	8.29	8.03	8.04	7.83	7.75	7.57

Time: 48 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Temperature (°C)	15.3	15.3	15.3	15.3	15.3	15.4
pH	8.27	8.03	8.05	7.78	7.68	7.43
Dissolved Oxygen (mg/L)	9.75	9.80	9.98	9.78	9.71	9.50

Time: 72 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Temperature (°C)	16.2	16.1	16.0	16.0	16.0	16.2
pH	8.36	8.08	8.12	7.95	7.83	7.65
Dissolved Oxygen (mg/L)	9.60	9.62	9.85	9.62	9.56	9.32

Time: 96 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Number of Dead Fish	0	0	0	0	0	0
Temperature (°C)	15.3	15.2	15.2	15.2	15.2	15.2
pH	8.32	8.02	8.06	7.85	7.76	7.57
Dissolved Oxygen (mg/L)	9.95	9.94	10.15	9.93	9.91	9.57

Sublethal Biological Effects

No sublethal biological effects observed

Observations/Comments

No toxicity observed

Rainbow Trout Bioassay Test Report – LC50

Sample Number: L208775-6

Summary Results

96-hour LC50 v/v (%):	>100
95% Lower Confidence Interval v/v (%):	NA
95% Upper Confidence Interval v/v (%):	NA
Method of Calculation:	NA
Confirmed by Graph:	NA

Sample Information

Sample Origin:	North/South Consultants
Sample Description:	BGS-EF
Sampling Date and Time:	04/09/20
Sampling Method:	Grab
Sampled By:	P.B.
Container(s) Description:	3 X 20 L Polyethylene pails w/liners
Sample Volume (L):	60 L
Date and Time Received:	04/09/21 08:00
Transit Irregularities:	None
Storage Temperature:	4

Test Information

Test Organism:	Oncorhynchus mykiss
Test Description:	Acute, 96-hour, Static, Pass/Fail
Reference Method:	EPS1/RM/13, 2nd Ed. Dec. 2000, Environment Canada
Performed By:	BJL
Starting Date & Time:	04/09/21 14:00
Source of Holding/Dilution Water:	Dechlorinated UV treated city of Winnipeg tap water
Container Description:	Polyethylene pails w/disposable liners
Test Solution Volume (L):	20 L
Test Solution Depth (cm):	34 cm
Number of Test Organisms/Container:	10
Deviations from Reference Method:	None

Enviro-Test Laboratories
745 Logan Ave
Winnipeg, MB R3E 3L5
(204) 945-3705

Condition of Sample Upon Arrival

Observations:

Colour:	None
Odour:	None
Turbidity:	None
Solids:	Small amount of sediment
Temperature (°C):	15.4
pH:	8.69
pH Adjustment:	Not Adjusted
Conductivity at 25°C (umhos/cm):	1530
Dissolved Oxygen (mg/L):	10.53

Pre-Aeration

Duration at 6.5 – 7.0 mL/min/L (min):	120	
Sample Test Concentration (v/v):	100%	0%
Before Pre-Aeration Dissolved Oxygen (% sat.):	105.3	96.2
After Pre-Aeration Dissolved Oxygen (% sat.):	102.2	95.9

Test Organism Data

Lot Number:	040907-T2
Weekly Mortality Preceding Test (%):	<2
Average Fork Length +/- 1 SD (cm):	4.2
Average Mass +/- 1 SD (g):	0.56
Loading Density (organisms/20mL):	0.28

Reference Toxicant

Toxicant:	Zinc Sulphate
Test Starting Date:	04/09/07
96-hour LC50 (mg/L ZnSO4):	0.53
95% Lower Confidence Interval (mg/L ZnSO4):	0.46
95% Upper Confidence Interval (mg/L ZnSO4):	0.62
Method of Calculation:	Stephan LC50 Program, Probit
Confirmed by Graph:	Yes
Historic Geometric Mean LC50 (mg/L ZnSO4):	0.76
95% Lower Confidence Interval (mg/L ZnSO4):	0.10
95% Upper Confidence Interval (mg/L ZnSO4):	1.42

Test Data

Time: 0 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
Temperature (°C)	14.6	14.9	15.2	15.3	15.4	15.5
pH	8.59	8.41	8.09	7.80	7.73	7.44
Conductivity at 25 °C (umhos/cm)	1530	834	518	243	266	160
Dissolved Oxygen (mg/L)	10.38	10.06	9.94	9.82	9.80	9.57

Time: 24 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Temperature (°C)	14.9	14.9	14.9	14.8	14.9	14.9
pH	8.43	8.04	7.87	7.79	7.78	7.57
Dissolved Oxygen (mg/L)	9.80	9.28	9.74	9.71	9.52	9.64

Time: 48 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Temperature (°C)	15.3	15.3	15.3	15.3	15.3	15.4
pH	8.31	7.90	7.85	7.70	7.59	7.43
Dissolved Oxygen (mg/L)	9.64	9.20	9.59	9.57	9.46	9.50

Time: 72 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Temperature (°C)	16.4	16.3	16.2	16.2	16.2	16.2
pH	8.35	7.96	7.93	7.82	7.62	7.65
Dissolved Oxygen (mg/L)	9.54	9.12	9.47	9.50	9.37	9.32

Time: 96 Hours

Sample Concentration v/v (%)	100	50	25	12.5	6.25	0
% Stress	0	0	0	0	0	0
% Mortality	0	0	0	0	0	0
Number of Dead Fish	0	0	0	0	0	0
Temperature (°C)	15.4	15.3	15.3	15.3	15.3	15.2
pH	8.30	7.92	7.86	7.79	7.76	7.57
Dissolved Oxygen (mg/L)	9.84	9.49	9.80	9.73	9.67	9.57

Sublethal Biological Effects

No sublethal biological effects observed

Observations/Comments

No toxicity observed. Daphnia present in sample.

ETL Enviro-Test LABORATORIES

A DIVISION OF ETL CHEMSPEC ANALYTICAL LIMITED

ANALYTICAL REPORT

NORTH/SOUTH CONSULTANTS

ATTN:

83 SCURFIELD BLVD

WINNIPEG MB R3Y 1G4

DATE: 19-NOV-04 12:11 PM Revision: 1

Lab Work Order #: L208775 **Sampled By:** P. BADIOU **Date Received:** 21-SEP-04

Project P.O. #:

Project Reference: BRANDON GS

Comments: The portion of the sample for metals was preserved by the client prior to submission.

Fraction-3: Extractable result is greater than Total for Sr, Tl, Zn. Results are within analytical error.

APPROVED BY: Paul Nicolas

PAUL NICOLAS

Project Manager

LABORATORY ACCREDITATIONS:

- **STANDARDS COUNCIL OF CANADA IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL)** FOR SPECIFIC TESTS AS REGISTERED BY THE COUNCIL (EDMONTON, CALGARY, GRANDE PRAIRIE, SASKATOON, WINNIPEG, THUNDER BAY, WATERLOO)
- **AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)** IN THE INDUSTRIAL HYGIENE PROGRAM (EDMONTON, WINNIPEG)
- **STANDARDS COUNCIL OF CANADA IN COOPERATION WITH THE CANADIAN FOOD INSPECTION AGENCY (CFIA)** FOR FERTILIZER AND FEED TESTING (SASKATOON) AND FOR MICROBIOLOGICAL TESTING IN FOOD (WINNIPEG)

LABORATORY RECOGNITIONS:

- **STANDARDS COUNCIL OF CANADA** - GLP COMPLIANT FACILITY (EDMONTON, OTTAWA)

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-1 AR-1								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								
Boron (B)-Dissolved	<0.009		0.009	mg/L	26-SEP-04	27-SEP-04	DAG	R222274
Total Phosphorous	0.005		0.001	mg/L		29-SEP-04	LJW	R223135
Total Suspended Solids	<2		2	mg/L		24-SEP-04	HL	R221700
Metal scan								
Silver (Ag)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Aluminum (Al)-Total	0.03		0.02	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Arsenic (As)-Total	<0.0005		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Boron (B)-Total	<0.03		0.03	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Barium (Ba)-Total	0.0004	RAMB	0.0003	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Beryllium (Be)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Bismuth (Bi)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Calcium (Ca)-Total	0.1	RAMB	0.1	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cadmium (Cd)-Total	<0.0002		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cobalt (Co)-Total	<0.0002		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Chromium (Cr)-Total	0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cesium (Cs)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Copper (Cu)-Total	0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Iron (Fe)-Total	0.07		0.05	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Potassium (K)-Total	<0.1		0.1	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Lithium (Li)-Total	<0.01		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Magnesium (Mg)-Total	0.01		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Manganese (Mn)-Total	0.0004		0.0003	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Molybdenum (Mo)-Total	<0.0002		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Sodium (Na)-Total	0.04		0.02	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Nickel (Ni)-Total	<0.002		0.002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Phosphorus (P)-Total	<0.05	RAMB	0.05	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Lead (Pb)-Total	<0.0005		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Rubidium (Rb)-Total	<0.0002		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Antimony (Sb)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Selenium (Se)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tin (Sn)-Total	<0.0005		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Strontium (Sr)-Total	0.0004	RAMB	0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tellurium (Te)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Titanium (Ti)-Total	0.0012		0.0009	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Thallium (Tl)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Uranium (U)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Vanadium (V)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tungsten (W)-Total	<0.0002	RAMB	0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Zinc (Zn)-Total	<0.01		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Zirconium (Zr)-Total	<0.0004		0.0004	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Routine Extractable + Metal scan								
pH								
PH	6.06		0.01	pH units		22-SEP-04	AKB	R222245
Sulphate Soluble								
Sulphate (SO4) - Soluble	<9		9	mg/L		23-SEP-04	ALW	R221604
Nitrate + Nitrite Soluble								
Nitrate+Nitrite-N	<0.01	RAMB	0.01	mg/L		23-SEP-04	ALW	R221604
Metal scan								
Silver (Ag)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Aluminum (Al)-Extractable	0.01		0.01	mg/L		26-SEP-04	DAG	R222274
Arsenic (As)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-1 AR-1								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								
Routine Extractable + Metal scan								
Metal scan								
Boron (B)-Extractable	<0.009		0.009	mg/L		26-SEP-04	DAG	R222274
Barium (Ba)-Extractable	<0.0003		0.0003	mg/L		26-SEP-04	DAG	R222274
Beryllium (Be)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Bismuth (Bi)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Calcium (Ca)-Extractable	<0.05		0.05	mg/L		26-SEP-04	DAG	R222274
Cadmium (Cd)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Cobalt (Co)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Chromium (Cr)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Cesium (Cs)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Copper (Cu)-Extractable	<0.0004		0.0004	mg/L		26-SEP-04	DAG	R222274
Iron (Fe)-Extractable	<0.01		0.01	mg/L		26-SEP-04	DAG	R222274
Potassium (K)-Extractable	<0.05		0.05	mg/L		26-SEP-04	DAG	R222274
Lithium (Li)-Extractable	<0.005		0.005	mg/L		26-SEP-04	DAG	R222274
Magnesium (Mg)-Extractable	<0.01		0.01	mg/L		26-SEP-04	DAG	R222274
Manganese (Mn)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Molybdenum (Mo)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Sodium (Na)-Extractable	<0.02		0.02	mg/L		26-SEP-04	DAG	R222274
Nickel (Ni)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Phosphorus (P)-Extractable	<0.02		0.02	mg/L		26-SEP-04	DAG	R222274
Lead (Pb)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Rubidium (Rb)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Antimony (Sb)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Selenium (Se)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Silicon (Si)-Extractable	<0.2		0.2	mg/L		26-SEP-04	DAG	R222274
Tin (Sn)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Strontium (Sr)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Tellurium (Te)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Titanium (Ti)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Thallium (Tl)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Uranium (U)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Vanadium (V)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Tungsten (W)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Zinc (Zn)-Extractable	<0.005		0.005	mg/L		26-SEP-04	DAG	R222274
Zirconium (Zr)-Extractable	<0.0004		0.0004	mg/L		26-SEP-04	DAG	R222274
Conductivity								
Conductivity	0.5		0.4	umhos/cm		23-SEP-04	AKB	R222630
Chloride Soluble								
Chloride (Cl) - Soluble	<9		9	mg/L		23-SEP-04	ALW	R221604
Calculated Hardness								
TDS (Calculated)	1			mg/L		28-SEP-04		
Hardness (as CaCO3)	<1			mg/L		28-SEP-04		
Alkalinity								
Alkalinity, Total (as CaCO3)	2		1	mg/L		23-SEP-04	AKB	R222629
Bicarbonate (HCO3)	2		2	mg/L		23-SEP-04	AKB	R222629
Carbonate (CO3)	<0.6		0.6	mg/L		23-SEP-04	AKB	R222629
Hydroxide (OH)	<0.4		0.4	mg/L		23-SEP-04	AKB	R222629
L208775-3 AR-2								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-3 AR-2								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								
Boron (B)-Dissolved	0.131		0.009	mg/L	26-SEP-04	27-SEP-04	DAG	R222274
Total Phosphorous	0.086		0.001	mg/L		29-SEP-04	LJW	R223135
Total Suspended Solids	28		2	mg/L		23-SEP-04	HL	R221191
Metal scan								
Silver (Ag)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Aluminum (Al)-Total	1.44		0.02	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Arsenic (As)-Total	0.0056		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Boron (B)-Total	0.15		0.03	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Barium (Ba)-Total	0.0633	RAMB	0.0003	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Beryllium (Be)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Bismuth (Bi)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Calcium (Ca)-Total	75.6	RAMB	0.1	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cadmium (Cd)-Total	<0.0002		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cobalt (Co)-Total	0.0007		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Chromium (Cr)-Total	0.002		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cesium (Cs)-Total	0.0002		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Copper (Cu)-Total	0.004		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Iron (Fe)-Total	0.89		0.05	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Potassium (K)-Total	11.1		0.1	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Lithium (Li)-Total	0.06		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Magnesium (Mg)-Total	44.3		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Manganese (Mn)-Total	0.0967		0.0003	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Molybdenum (Mo)-Total	0.0031		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Sodium (Na)-Total	71.8		0.02	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Nickel (Ni)-Total	0.006		0.002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Phosphorus (P)-Total	0.11	RAMB	0.05	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Lead (Pb)-Total	0.0007		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Rubidium (Rb)-Total	0.0038		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Antimony (Sb)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Selenium (Se)-Total	0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tin (Sn)-Total	<0.0005		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Strontium (Sr)-Total	0.333	RAMB	0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tellurium (Te)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Titanium (Ti)-Total	0.0292		0.0009	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Thallium (Tl)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Uranium (U)-Total	0.0027		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Vanadium (V)-Total	0.007		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tungsten (W)-Total	<0.0002	RAMB	0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Zinc (Zn)-Total	0.01		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Zirconium (Zr)-Total	0.0012		0.0004	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Routine Extractable + Metal scan								
pH								
PH	8.40		0.01	pH units		22-SEP-04	AKB	R222245
Sulphate Soluble								
Sulphate (SO4) - Soluble	218		9	mg/L		23-SEP-04	ALW	R221604
Nitrate + Nitrite Soluble								
Nitrate+Nitrite-N	0.10	RAMB	0.01	mg/L		23-SEP-04	ALW	R221604
Metal scan								
Silver (Ag)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Aluminum (Al)-Extractable	0.10		0.01	mg/L		26-SEP-04	DAG	R222274
Arsenic (As)-Extractable	0.0056		0.0005	mg/L		26-SEP-04	DAG	R222274

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-3 AR-2								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								
Routine Extractable + Metal scan								
Metal scan								
Boron (B)-Extractable	0.139		0.009	mg/L		26-SEP-04	DAG	R222274
Barium (Ba)-Extractable	0.0525		0.0003	mg/L		26-SEP-04	DAG	R222274
Beryllium (Be)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Bismuth (Bi)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Calcium (Ca)-Extractable	66.1		0.05	mg/L		26-SEP-04	DAG	R222274
Cadmium (Cd)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Cobalt (Co)-Extractable	0.0005		0.0002	mg/L		26-SEP-04	DAG	R222274
Chromium (Cr)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Cesium (Cs)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Copper (Cu)-Extractable	0.0024		0.0004	mg/L		26-SEP-04	DAG	R222274
Iron (Fe)-Extractable	0.25		0.01	mg/L		26-SEP-04	DAG	R222274
Potassium (K)-Extractable	9.34		0.05	mg/L		26-SEP-04	DAG	R222274
Lithium (Li)-Extractable	0.059		0.005	mg/L		26-SEP-04	DAG	R222274
Magnesium (Mg)-Extractable	39.6		0.01	mg/L		26-SEP-04	DAG	R222274
Manganese (Mn)-Extractable	0.0880		0.0002	mg/L		26-SEP-04	DAG	R222274
Molybdenum (Mo)-Extractable	0.0027		0.0001	mg/L		26-SEP-04	DAG	R222274
Sodium (Na)-Extractable	63.5		0.02	mg/L		26-SEP-04	DAG	R222274
Nickel (Ni)-Extractable	0.0032		0.0002	mg/L		26-SEP-04	DAG	R222274
Phosphorus (P)-Extractable	0.08		0.02	mg/L		26-SEP-04	DAG	R222274
Lead (Pb)-Extractable	0.0005		0.0001	mg/L		26-SEP-04	DAG	R222274
Rubidium (Rb)-Extractable	0.0019		0.0002	mg/L		26-SEP-04	DAG	R222274
Antimony (Sb)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Selenium (Se)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Silicon (Si)-Extractable	5.3		0.2	mg/L		26-SEP-04	DAG	R222274
Tin (Sn)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Strontium (Sr)-Extractable	0.334		0.0001	mg/L		26-SEP-04	DAG	R222274
Tellurium (Te)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Titanium (Ti)-Extractable	0.0020		0.0005	mg/L		26-SEP-04	DAG	R222274
Thallium (Tl)-Extractable	0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Uranium (U)-Extractable	0.0023		0.0001	mg/L		26-SEP-04	DAG	R222274
Vanadium (V)-Extractable	0.004		0.001	mg/L		26-SEP-04	DAG	R222274
Tungsten (W)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Zinc (Zn)-Extractable	0.012		0.005	mg/L		26-SEP-04	DAG	R222274
Zirconium (Zr)-Extractable	<0.0004		0.0004	mg/L		26-SEP-04	DAG	R222274
Conductivity								
Conductivity	898		0.4	umhos/cm		22-SEP-04	AKB	R222245
Chloride Soluble								
Chloride (Cl) - Soluble	29		9	mg/L		23-SEP-04	ALW	R221604
Calculated Hardness								
TDS (Calculated)	568			mg/L		27-SEP-04		
Hardness (as CaCO3)	328			mg/L		27-SEP-04		
Alkalinity								
Alkalinity, Total (as CaCO3)	237		1	mg/L		22-SEP-04	AKB	R222245
Bicarbonate (HCO3)	270		2	mg/L		22-SEP-04	AKB	R222245
Carbonate (CO3)	9.3		0.6	mg/L		22-SEP-04	AKB	R222245
Hydroxide (OH)	<0.4		0.4	mg/L		22-SEP-04	AKB	R222245
L208775-4 AR-2 - TROUT								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-4 AR-2 - TROUT								
Sample Date: 20-SEP-04								
Matrix: SURFACE WATER								
Trout Bioassay LC50	See Attached				21-SEP-04	28-SEP-04	BJL	R222789
L208775-5 BGS-EF								
Sample Date: 20-SEP-04								
Matrix: EFFLUENT								
Boron (B)-Dissolved	0.859		0.009	mg/L	26-SEP-04	27-SEP-04	DAG	R222274
Total Phosphorous	0.101		0.001	mg/L		29-SEP-04	LJW	R223135
Total Suspended Solids	5		2	mg/L		23-SEP-04	HL	R221191
Metal scan								
Silver (Ag)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Aluminum (Al)-Total	1.16		0.02	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Arsenic (As)-Total	0.0567		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Boron (B)-Total	0.97		0.03	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Barium (Ba)-Total	0.460	RAMB	0.0003	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Beryllium (Be)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Bismuth (Bi)-Total	<0.0001		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Calcium (Ca)-Total	85.8	RAMB	0.1	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cadmium (Cd)-Total	<0.0002		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cobalt (Co)-Total	0.0005		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Chromium (Cr)-Total	0.023		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Cesium (Cs)-Total	0.0031		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Copper (Cu)-Total	0.007		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Iron (Fe)-Total	<0.05		0.05	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Potassium (K)-Total	23.6		0.1	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Lithium (Li)-Total	0.11		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Magnesium (Mg)-Total	48.6		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Manganese (Mn)-Total	0.0083		0.0003	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Molybdenum (Mo)-Total	0.0740		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Sodium (Na)-Total	221		0.02	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Nickel (Ni)-Total	0.005		0.002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Phosphorus (P)-Total	0.10	RAMB	0.05	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Lead (Pb)-Total	<0.0005		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Rubidium (Rb)-Total	0.0268		0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Antimony (Sb)-Total	0.002		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Selenium (Se)-Total	0.038		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tin (Sn)-Total	<0.0005		0.0005	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Strontium (Sr)-Total	2.55	RAMB	0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tellurium (Te)-Total	<0.001		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Titanium (Ti)-Total	0.0208		0.0009	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Thallium (Tl)-Total	0.0006		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Uranium (U)-Total	0.0039		0.0001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Vanadium (V)-Total	0.096		0.001	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Tungsten (W)-Total	0.0026	RAMB	0.0002	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Zinc (Zn)-Total	<0.01		0.01	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Zirconium (Zr)-Total	0.0006		0.0004	mg/L	24-SEP-04	25-SEP-04	DAG	R222169
Routine Extractable + Metal scan								
pH								
PH	8.86		0.01	pH units		22-SEP-04	AKB	R222245
Sulphate Soluble								
Sulphate (SO4) - Soluble	538		9	mg/L		30-SEP-04	ALW	R223818
Nitrate + Nitrite Soluble								

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-5 BGS-EF								
Sample Date: 20-SEP-04								
Matrix: EFFLUENT								
Routine Extractable + Metal scan								
Nitrate + Nitrite Soluble								
Nitrate+Nitrite-N	0.10	RAMB	0.01	mg/L		23-SEP-04	ALW	R221604
Metal scan								
Silver (Ag)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Aluminum (Al)-Extractable	0.98		0.01	mg/L		26-SEP-04	DAG	R222274
Arsenic (As)-Extractable	0.0561		0.0005	mg/L		26-SEP-04	DAG	R222274
Boron (B)-Extractable	0.880		0.009	mg/L		26-SEP-04	DAG	R222274
Barium (Ba)-Extractable	0.418		0.0003	mg/L		26-SEP-04	DAG	R222274
Beryllium (Be)-Extractable	<0.001		0.001	mg/L		26-SEP-04	DAG	R222274
Bismuth (Bi)-Extractable	<0.0001		0.0001	mg/L		26-SEP-04	DAG	R222274
Calcium (Ca)-Extractable	67.2		0.05	mg/L		26-SEP-04	DAG	R222274
Cadmium (Cd)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Cobalt (Co)-Extractable	0.0004		0.0002	mg/L		26-SEP-04	DAG	R222274
Chromium (Cr)-Extractable	0.020		0.001	mg/L		26-SEP-04	DAG	R222274
Cesium (Cs)-Extractable	0.0030		0.0001	mg/L		26-SEP-04	DAG	R222274
Copper (Cu)-Extractable	0.0054		0.0004	mg/L		26-SEP-04	DAG	R222274
Iron (Fe)-Extractable	0.02		0.01	mg/L		26-SEP-04	DAG	R222274
Potassium (K)-Extractable	18.5		0.05	mg/L		26-SEP-04	DAG	R222274
Lithium (Li)-Extractable	0.096		0.005	mg/L		26-SEP-04	DAG	R222274
Magnesium (Mg)-Extractable	40.4		0.01	mg/L		26-SEP-04	DAG	R222274
Manganese (Mn)-Extractable	0.0074		0.0002	mg/L		26-SEP-04	DAG	R222274
Molybdenum (Mo)-Extractable	0.0704		0.0001	mg/L		26-SEP-04	DAG	R222274
Sodium (Na)-Extractable	180		0.02	mg/L		26-SEP-04	DAG	R222274
Nickel (Ni)-Extractable	0.0030		0.0002	mg/L		26-SEP-04	DAG	R222274
Phosphorus (P)-Extractable	0.11		0.02	mg/L		26-SEP-04	DAG	R222274
Lead (Pb)-Extractable	0.0002		0.0001	mg/L		26-SEP-04	DAG	R222274
Rubidium (Rb)-Extractable	0.0261		0.0002	mg/L		26-SEP-04	DAG	R222274
Antimony (Sb)-Extractable	0.002		0.001	mg/L		26-SEP-04	DAG	R222274
Selenium (Se)-Extractable	0.039		0.001	mg/L		26-SEP-04	DAG	R222274
Silicon (Si)-Extractable	4.6		0.2	mg/L		26-SEP-04	DAG	R222274
Tin (Sn)-Extractable	<0.0002		0.0002	mg/L		26-SEP-04	DAG	R222274
Strontium (Sr)-Extractable	2.49		0.0001	mg/L		26-SEP-04	DAG	R222274
Tellurium (Te)-Extractable	<0.0005		0.0005	mg/L		26-SEP-04	DAG	R222274
Titanium (Ti)-Extractable	0.0149		0.0005	mg/L		26-SEP-04	DAG	R222274
Thallium (Tl)-Extractable	0.0007		0.0001	mg/L		26-SEP-04	DAG	R222274
Uranium (U)-Extractable	0.0034		0.0001	mg/L		26-SEP-04	DAG	R222274
Vanadium (V)-Extractable	0.087		0.001	mg/L		26-SEP-04	DAG	R222274
Tungsten (W)-Extractable	0.0029		0.0002	mg/L		26-SEP-04	DAG	R222274
Zinc (Zn)-Extractable	<0.005		0.005	mg/L		26-SEP-04	DAG	R222274
Zirconium (Zr)-Extractable	<0.0004		0.0004	mg/L		26-SEP-04	DAG	R222274
Conductivity								
Conductivity	1530		0.4	umhos/cm		22-SEP-04	AKB	R222245
Chloride Soluble								
Chloride (Cl) - Soluble	39		9	mg/L		23-SEP-04	ALW	R221604
Calculated Hardness								
TDS (Calculated)	1010			mg/L		01-OCT-04		
Hardness (as CaCO3)	334			mg/L		01-OCT-04		
Alkalinity								
Alkalinity, Total (as CaCO3)	208		1	mg/L		22-SEP-04	AKB	R222245
Bicarbonate (HCO3)	198		2	mg/L		22-SEP-04	AKB	R222245
Carbonate (CO3)	27.4		0.6	mg/L		22-SEP-04	AKB	R222245

ENVIRO-TEST ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L208775-5 BGS-EF								
Sample Date: 20-SEP-04								
Matrix: EFFLUENT								
Routine Extractable + Metal scan								
Alkalinity								
Hydroxide (OH)	<0.4		0.4	mg/L		22-SEP-04	AKB	R222245
L208775-6 BGS-EF - TROUT								
Sample Date: 20-SEP-04								
Matrix: EFFLUENT								
Trout Bioassay LC50	See Attached				21-SEP-04	28-SEP-04	BJL	R222789

Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier key listed:

Qualifier	Description
RAMB	Result Adjusted For Method Blank

Methods Listed (if applicable):

ETL Test Code	Matrix	Test Description	Preparation Method Reference(Based On)	Analytical Method Reference(Based On)
ALK-TOT-WP	Water	Alkalinity		APHA 4500B, 2510B, 2320B, 1998
Alkalinity of water is a measure of its acid neutralizing capacity. Alkalinity is imparted by bicarbonate, carbonate and hydroxide components of water. It is determined by titration with a standard solution of strong mineral acid to the successive HCO3- and H2CO3 endpoints indicated electrometrically.				
B-DIS-LOW-WP	Water	Boron (B)-Dissolved		EPA 200.8 Rev 5.4 May 1994
CL-SOL-WP	Water	Chloride Soluble		APHA4500;1998/LACHAT;MAR 1997
Chloride - Colourimetric using Mercuric Thiocyanate				
EC-WP	Water	Conductivity		APHA 4500B, 2510B, 2320B, 1998
Conductivity of an aqueous solution refers to its ability to carry an electric current. Conductance of a solution is measured between two spatially fixed and chemically inert electrodes.				
MET-SCAN-EXT-LOW-WP	Water	Metal scan		EPA 200.8 Rev 5.4 May 1994
MET-SCAN-TOT-LOW-WP	Water	Metal scan		EPA 200.8 Rev 5.4 May 1994
N2N3-SOL-WP	Water	Nitrate + Nitrite Soluble		APHA4500;1998/LACHAT;MAR 1997
P-TOTAL-WP	Water	Phosphorus, Total		APHA, 1998
Samples are digested using a sulphuric acid-persulphate mixture to convert organic phosphorous to orthophosphate. The samples are analyzed by either the Flow Injection Analysis (FIA) or the Segmented Flow Analysis (SFA) method. The absorbance measured by the instrument is proportional to the concentration of orthophosphate in the sample, and is reported as phosphorous. Samples are analyzed for total or total dissolved phosphorous depending on the sample pretreatment.				
PH-WP	Water	pH		APHA 4500B, 2510B, 2320B, 1998
pH of a sample is the determination of the activity of the hydrogen ions by potentiometric measurement using a standard hydrogen electrode and a reference electrode.				
SO4-SOL-WP	Water	Sulphate Soluble		APHA4500;1998/LACHAT;MAR 1997
Sulphate - Turbidimetric				
SOLIDS-TOTSUS-LR-WP	Water	Total Suspended Solids		APHA 2540
The residue retained by a prepared 1.5 um Whatman 934-AH glass microfibre filter dried at 105 degrees C. A method detection limit of 2 mg/L can be achieved when 500 mL of sample is used.				

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.

Chain of Custody numbers:

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
WP	Enviro-Test Laboratories - Winnipeg, Manitoba, Canada		

Reference Information

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency. The Laboratory warning units are determined under column heading D.L.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
< - Less than
D.L. - Detection Limit
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
UNLESS OTHERWISE STATED, SAMPLES ARE NOT CORRECTED FOR CLIENT FIELD BLANKS.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

Enviro-Test Laboratories has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, Enviro-Test Laboratories assumes no liability for the use or interpretation of the results.

APPENDIX 2. Enviro-Test and HydroQual Laboratories analytical test results: January and February 2005 sampling.

HydroQual Laboratories Ltd.
#3, 6125 12th Street SE Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121 Fax (403) 252-9363 www.hydroqual.ca

Test Report

Client:	ENV120	Sample:	20050029

Client

Client: Enviro-Test Labs
Address: 745 Logan Ave
City: Winnipeg
Country: Canada
Billing: L237213
Tel: 204-945-3705

Operation: Winnipeg
Prov./State: MB
Postal/ZIP Code: R3E 3L5
Contact: Judy Dalmaijer
Fax: 204-945-0763

Sample

type: water method: grab
collected: 2005/01/04 at 1115 by not given
shipped: 2005/01/06 by Purolator
received: 2005/01/07 at 1045 by K. de Windt
signed-in by: B. Crago
container: 2 x 20L pails - unfrozen sample split for testing
seals present: none initials on seals no frozen 1 unfrozen, 1 with ice crystals
storage: 4 ± 2 °C in darkness initial temperature (°C) 0
Samples are disposed following Supporting Work Instruction 4.3.1.4.3

Physical and Chemical Measurements at Sample Receipt

lab code	-1
client code	L237213

water/effluent/pore water

pH	8.9
EC (uS/cm)	2320
DO (mg/L)	10.5
temp (°C)	7
alkalinity	not done
hardness	532
NH4 (mg/L)	not done
TRC (mg/L)	not done
colour	pale yellow
odour	odourless

soil/sediment

moisture (%)	na
sand:silt:clay	na
TOC (%)	na

Test Log

type	AG-D	CD-D	FM-D
number	20050097	20050096	20050098
started	2005/01/07	2005/01/07	2005/01/07
ended	2005/01/10	2005/01/14	2005/01/14
reported	2005/01/24	2005/01/24	2005/01/24
faxed	na	na	na

Notes: D, definitive; S, single treatment; EC, electrical conductivity; DO, dissolved oxygen; TRC, total residual chlorine; TOC, total organic carbon; na, not applicable

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Test Report

Client:	ENV120	Sample:	20050029	Test:	20050097

Method: 72h Algal Growth Inhibition Test (HQ 4.4.2.7)
reference: Biological Test Method: Growth Inhibition Test Using the Freshwater Alga *Selenastrum capricornutum*, 1992. Environment Canada, EPS 1/RM/25. (ammended November 1997)

Client: Enviro-Test Labs Operation: Winnipeg

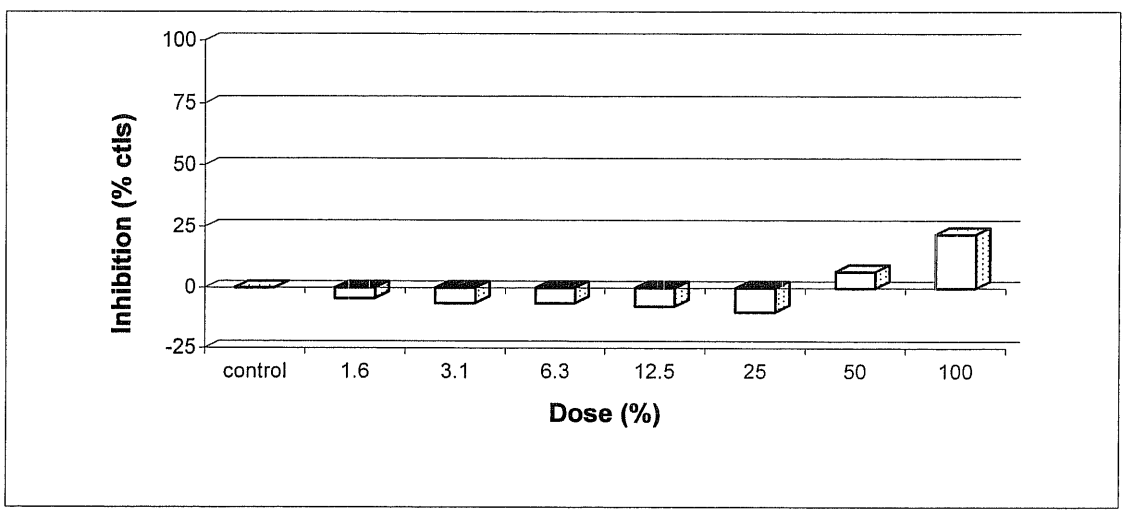
Sample:
description: L237213, 305572 Ash Lagoon
collected: 2005/01/04 at 1115 by not given
received: 2005/01/07 at 1045 by K. de Windt

Test:
started: 2005/01/07 at 1600 by I. Carleton-Dodds
ended: 2005/01/10 at 1500 by I. Carleton-Dodds
reported: 2005/01/24 by K. Bergen

Result:

Endpoint	Value	Confidence Limits	Units	Method Calculated
IC25	>100		%	estimated
IC50	>100		%	estimated
NOEC	100		%	estimated
LOEC	>100		%	estimated

Notes: ICx, concentrations inhibiting growth by 'x' percent relative to controls; NOEC & LOEC, no and lowest observed effect concentrations; MSD, minimum significant difference



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Test Report

Test Data

Client:	ENV120	Sample:	20050029	Test:	20050097

Sample Pretreatment			
pH adjustment	not required	preaeration	not required
turbidity	filtered through a 0.45um membrane filter		
other	sample spiked with nutrients as required by the method; no other chemicals added		

Final Cell Densities (x10^3 / mL)

Dose (%)	Replicate a	b	c	Average	sd	cv (%)	Percent Controls	Inhibition (%)
control	398	381	394	391	9	2	100	0
1.6	375	433	417	408	30	7	104	-4
3.1	367	433	448	416	43	10	106	-6
6.3	390	433	425	416	23	5	106	-6
12.5	367	464	433	421	49	12	108	-8
25	456	382	452	430	41	10	110	-10
50	352	371	371	364	11	3	93	7
100	301	290	325	305	18	6	78	22

Comments

The test was conducted in 96 well microplates (220 uL in 5 wells per treatment; 3 plates per sample).
The test species was *Raphidocelis subcapitata* (formerly *Selenastrum capricornutum*).
The test was started with 7 day old, exponentially growing cells from in-house cultures.
The plates were incubated at 25°C under continuous light (4,000 lux).

Inoculum (cells/mL)	
a	9600
b	9200
c	9600
mean	9467
cv (%)	2

Daily Temperature	
0	25
1	25
2	25
3	26
mean	25
cv (%)	2

control pH:	initial	6.0	100% pH:	initial	7.0
	final	8.5			

Dose (%)	Absorbance (430nm)	Direct Cell Counts (/0.5mL)
ctl-a	0.10	6000
12.5-a	0.10	4650
100-a	0.08	1700
ctl-b	0.10	4000
12.5-b	0.12	6750
100-b	0.08	1850
ctl-c	0.10	4350
12.5-c	0.11	6300
100-c	0.08	1900

Final cell densities were determined from the absorbance at 430 nm calibrated against cell counts.
The conversion factor for absorbance to cells per millilitre was 3863 with a cv of 36 %
Control growth was a 41 fold increase over the inoculum with a cv of 2 %
No significant stimulatory or inhibitory trends were detected by Mann-Kendall Trend analysis (p=0.05).

Notes: cv, coefficient of variance (%); sd, standard deviation

The test data and results are verified correct.

Authorized by K.Steele, B.Sc., Quality Assurance Officer

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Test Report

Client:	ENV120	Sample:	20050029	Test:	20050096

Method: *Ceriodaphnia* Survival and Reproduction Test (five treatments plus a control)
reference: Biological Test Method: Test of Reproduction and Survival Using the Cladoceran *Ceriodaphnia dubia*, 1992. Environ.Can., EPS 1/RM/21. (amended November, 1997)

Client: Enviro-Test Labs Operation: Winnipeg

Sample:
description: L237213, 305572 Ash Lagoon
collected: 2005/01/04 at 1115 by not given
received: 2005/01/07 at 1045 by K. de Windt

Test:
started: 2005/01/07 at 1130 by B. Crago
ended: 2005/01/14 at 1045 by I. Carleton-Dodds
reported: 2005/01/24 by K. Bergen

Result:

	Endpoint	Value	Confidence Limits	Units	Method Calculated
Acute: (mortality)	LC25	>100		%	estimated
	LC50	>100		%	estimated
	NOEC	100		%	estimated
	LOEC	> 100		%	estimated
	MSD	could not be calculated			
Chronic: (fecundity)	IC25	>100		%	estimated
	IC50	>100		%	estimated
	NOEC	100		%	estimated
	LOEC	>100		%	estimated
	MSD	could not be calculated			

Notes: LCx & ICx, concentrations lethal or inhibitory to 'x' percent of the test population; NOEC & LOEC, no and lowest observed effect concentrations; fecundity, reproduction as the number of young produced

Comments: The test results are plotted on page 2 of the report.
No unusual behaviour, appearance, or treatment of the test organisms was noted prior to or during the conduct of the test. All test organisms came from a brood source that are all the same age.
The numbers in bold print under the " Biology (#, young produced . . . .)" section refers to the number of young produced the day the organism died.
Our liability is limited to the cost of the test requested. No liability is assumed for the application and or interpretation of the test results.

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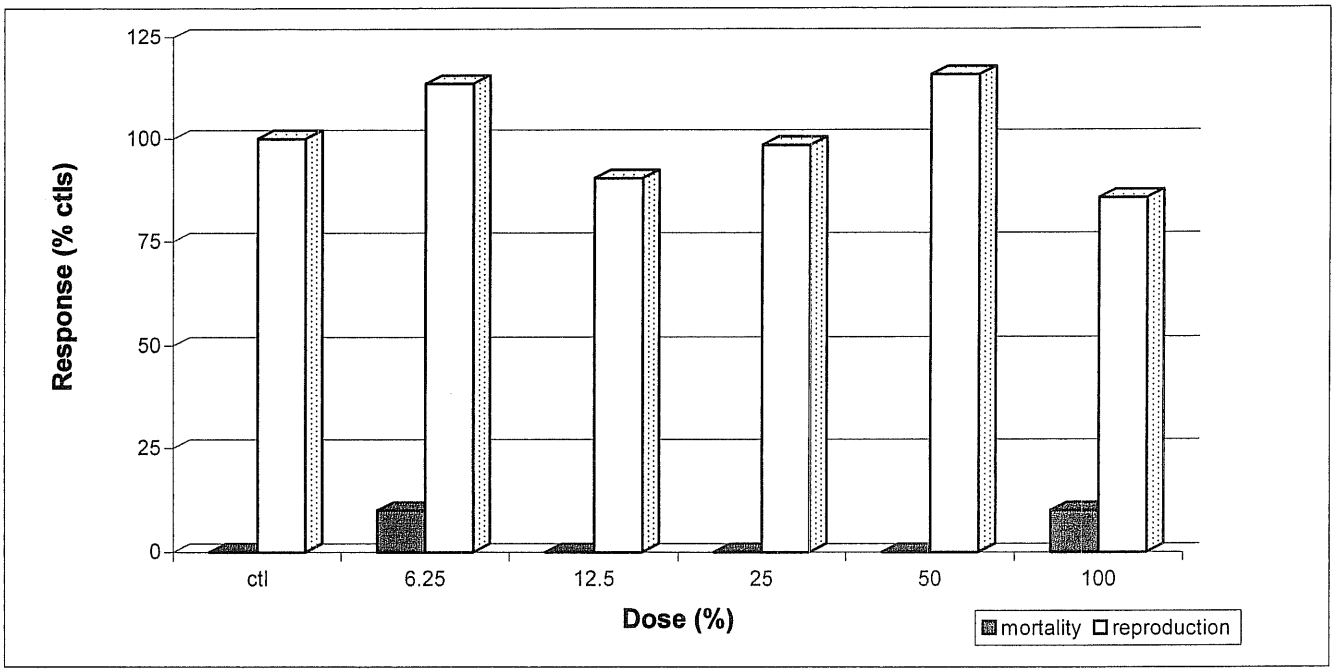
Test Report

Client:	ENV120	Sample:	20050029	Test:	20050096



Test Design

Organism: *Ceriodaphnia dubia* Source: in-house cultures Age: <24 h; released within 12 h
The number of young produced by each brood organism in the last complete brood before use was 7
No ephippia were noted in the cultures 7 days before test initiation. Culture mortality was 7%
during this period and the mean number of surviving young per adult was 17
The dilution water was a mixture of moderately hard reconstituted water and Bow River Water (50:50).
Chemicals added to dilution water: 0.96 g $NaHCO_3$, 0.60 g $CaSO_4$, 0.60 g $MgSO_4$, 0.04 g KCl per 20L
The tests were conducted in 30 mL plastic vessels containing 15 mL of solution (2cm depth).
The test organisms were fed daily a mixture of fermented trout chow, yeast, alfalfa powder, and the green alga *Raphidocelis subcapitata*. food expiration: 2005/01/16

Sample Information

The test was conducted with three subsamples. Samples a, b, and c were for days 0 to 2, 3 to 5, and 6 to 7.
The sample was not aerated, filtered or pH adjusted prior to testing or during testing.
The dissolved oxygen concentration (mg/L) was 7.5 The sample pH was 8.8

Test Log

Date	Day	Time	Technicians	Comments
2005/01/07	0	1130	B. Crago	Test *Ceriodaphnia* appear normal.
2005/01/08	1	1115	B. Crago	Test *Ceriodaphnia* appear normal.
2005/01/09	2	1130	B. Crago	Test *Ceriodaphnia* appear normal.
2005/01/10	3	1320	K. de Windt	Test *Ceriodaphnia* appear normal.
2005/01/11	4	1430	I. Carleton-Dodds	Test *Ceriodaphnia* appear normal.
2005/01/12	5	1430	K. de Windt	Test *Ceriodaphnia* appear normal.
2005/01/13	6	1145	K. de Windt	Test *Ceriodaphnia* appear normal.
2005/01/14	7	1045	I. Carleton-Dodds	Test *Ceriodaphnia* appear normal.

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Test Report

Test Data

Client: ENV120	Sample: 20050029	Test: 20050096

Chemistry

dose (%) / day	New Solutions ctl	6.25	12.5	25	50	100		Old Solutions ctl	6.25	12.5	25	50	100	
	pH (units)							pH (units)						
0	8.2	8.3	8.4	8.5	8.7	8.8								
1	8.2	8.3	8.5	8.6	8.7	8.8		8.3	8.3	8.4	8.5	8.6	8.7	
2	8.3	8.4	8.5	8.6	8.7	8.8		8.4	8.4	8.4	8.4	8.5	8.7	
3	8.3	8.3	8.4	8.5	8.7	8.8		8.3	8.3	8.3	8.4	8.5	8.7	
4	8.2	8.3	8.4	8.5	8.7	8.8		8.3	8.3	8.3	8.3	8.4	8.6	
5	8.2	8.3	8.4	8.5	8.7	8.8		8.3	8.2	8.2	8.3	8.5	8.6	
6	8.2	8.3	8.4	8.5	8.7	8.8		8.4	8.3	8.3	8.4	8.5	8.7	
7								8.3	8.3	8.4	8.5	8.5	8.7	
8														
	conductance (uS/cm)							conductance (uS/cm)						
0	458	566	677	918	1348	2300								
1	468	570	685	913	1343	2300		489	588	696	965	1385	2310	
2	494	573	678	898	1313	2260		524	615	726	1017	1424	2370	
3	486	578	691	918	1322	2320		503	618	764	1091	1461	2480	
4	449	541	642	864	1315	2270		519	609	750	1065	1419	2390	
5	436	547	671	886	1330	2280		508	565	748	1041	1425	2350	
6	436	552	666	897	1309	2270		494	582	740	989	1397	2390	
7								585	627	795	1097	1478	2500	
8														
	dissolved oxygen (mg/L)							dissolved oxygen (mg/L)						
0	7.2	7.3	7.3	7.4	7.4	7.5								
1	7.2	7.2	7.3	7.2	7.2	7.2		6.8	6.7	6.6	6.7	6.7	6.6	
2	7.2	7.3	7.3	7.3	7.3	7.3		7.0	6.8	6.8	6.9	6.8	6.8	
3	7.2	7.1	7.1	7.2	7.2	7.2		7.0	7.0	7.0	7.0	7.0	6.9	
4	7.0	7.1	7.1	7.2	7.2	7.3		6.9	6.9	6.8	6.9	7.0	6.8	
5	7.0	7.1	7.1	7.1	7.1	7.1		6.9	6.7	6.8	6.9	6.8	6.8	
6	7.0	7.1	7.1	7.1	7.1	7.1		6.8	6.8	6.7	6.8	6.8	6.6	
7								6.9	6.9	6.9	6.8	6.8	6.7	
8														
	temperature (°C)							temperature (°C)						
0	24	24	24	24	24	24								
1	24	24	24	24	24	24		24	24	24	24	24	24	
2	24	24	24	24	24	24		24	24	24	24	24	24	
3	24	24	24	24	24	24		24	24	24	24	24	24	
4	24	24	24	24	24	24		24	24	24	24	24	24	
5	24	24	24	24	24	24		24	24	24	24	24	24	
6	24	24	24	24	24	24		24	24	24	24	24	24	
7								24	24	24	24	24	24	
8														

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Test Report

Test Data

Client: ENV120	Sample: 20050029	Test: 20050096

Biology (#, young produced; 0, no young; blank, dead)

dose (%)	ctl	6.25	12.5	25	50	100		ctl	6.25	12.5	25	50	100	
replicate	day 1							day 5						
1	0	0	0	0	0	0		0	8	9	0	8	7	
2	0	0	0	0	0	0		7	10	7	0	0	8	
3	0	0	0	0	0	0		8	9	7	0	10	8	
4	0	0	0	0	0	0		7	7	9	9	0	6	
5	0	0	0	0	0	0		7		0	0	8		
6	0	0	0	0	0	0		0	0	0	0	0	0	
7	0	0	0	0	0	0		7	7	8	0	8	8	
8	0	0	0	0	0	0		8	9	9	8	9	9	
9	0	0	0	0	0	0		7	10	7	8	10	10	
10	0	0	0	0	0	0		7	11	10	10	12	6	
	day 2							day 6						
1	0	0	0	0	0	0		8	0	0	8	0	0	
2	0	0	0	0	0	0		0	10	4	8	4	0	
3	0	0	0	0	0	0		0	0	0	9	0	9	
4	0	0	0	0	0	0		7	10	0	0	11	10	
5	0	0	0	0	0	0		0		9	7	10		
6	0	0	0	0	0	0		9	8	6	9	9	8	
7	0	0	0	0	0	0		0	0	0	8	12	6	
8	0	0	0	0	0	0		11	9	0	0	13	10	
9	0	0	0	0	0	0		8	8	0	0	12	9	
10	0	0	0	0	0	0		0	0	0	0	0	0	
	day 3							day 7						
1	0	0	0	0	0	0		0	6	0	0	4	0	
2	0	0	0	0	0	0		8	0	0	6	0	8	
3	0	0	0	0	0	0		10	8	8	8	12	0	
4	3	4	0	0	4	4		2	10	12	8	10	12	
5	0	0	0	0	4	0		8		0	10	0		
6	0	0	0	0	0	0		2	0	0	0	0	0	
7	0	0	0	0	0	0		8	8	8	8	0	2	
8	0	3	0	0	0	0		0	12	8	8	0	0	
9	0	0	0	0	0	0		0	0	8	12	0	0	
10	3	0	0	0	0	0		6	8	6	9	8	0	
	day 4							day 8						
1	4	3	4	2	2	3								
2	4	4	3	4	2	4								
3	3	4	4	4	4	3								
4	0	0	3	3	7	0								
5	3	**4**	3	3	0									
6	4	6	0	2	4	0								
7	3	4	6	4	5	2								
8	3	2	2	0	5	3								
9	3	6	6	4	4	2								
10	8	3	2	4	4	2								

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Test Report

Summary Tables

Client: ENV120	Sample: 20050029	Test: 20050096

Biology

Mortality (%)

dose (%) / day	ctl	6.25	12.5	25	50	100	
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	10	0	0	0	10	
5	0	10	0	0	0	10	
6	0	10	0	0	0	10	
7	0	10	0	0	0	10	
8							
totals	0	10	0	0	0	10	

Daily Young Production

	ctl	6.25	12.5	25	50	100	
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	6	7	0	0	8	4	
4	35	36	33	30	37	19	
5	58	71	66	35	65	62	
6	43	45	19	49	71	52	
7	44	52	50	69	34	22	
8							
totals	186	211	168	183	215	159	

average young per adult

ctl	6.25	12.5	25	50	100	
19	21	17	18	22	16	

young production as a percent of controls

ctl	6.25	12.5	25	50	100	
100	113	90	98	116	85	

Total Young Produced by Each Adult

replicate	ctl	6.25	12.5	25	50	100	
1	12	17	13	10	14	10	
2	19	24	14	18	6	20	
3	21	21	19	21	26	20	
4	19	31	24	20	32	32	
5	18	4	12	20	22	0	
6	15	14	6	11	13	8	
7	18	19	22	20	25	18	
8	22	35	19	16	27	22	
9	18	24	21	24	26	21	
10	24	22	18	23	24	8	

Chemistry

New Solutions

dose (%)	ctl	6.25	12.5	25	50	100	
Average Values							
pH	8.2	8.3	8.4	8.5	8.7	8.8	
EC	461	561	673	899	1326	2286	
DO	7.1	7.2	7.2	7.2	7.2	7.2	
temp	24	24	24	24	24	24	
Variance (%)							
pH	1	0	1	1	0	0	
EC	5	3	2	2	1	1	
DO	2	1	1	1	1	2	
temp	0	0	0	0	0	0	

Old Solutions

ctl	6.25	12.5	25	50	100	
8.3	8.3	8.3	8.4	8.5	8.7	
517	601	746	1038	1427	2399	
6.9	6.8	6.8	6.9	6.8	6.7	
24	24	24	24	24	24	
1	1	1	1	1	1	
6	4	4	5	2	3	
1	2	2	1	2	2	
0	0	0	0	0	0	

The test data and results are verified correct.

Authorized by K.Steele, B.Sc., Quality Assurance Officer

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Test Report

Client:	ENV120	Sample:	20050029	Test:	20050098

Method: 7 d Fathead Minnow Survival and Growth Test (five treatments plus a control)
reference: Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnow, 1992. Environment Canada, EPS 1/RM/22. (ammended 1997)

Client: Enviro-Test Labs Operation: Winnipeg

Sample:
description: L237213, 305572 Ash Lagoon
collected: 2005/01/04 at 1115 by not given
received: 2005/01/07 at 1045 by K. de Windt

Test:
started: 2005/01/07 at 1545 by K. de Windt/H. Hausmanis
ended: 2005/01/14 at 1600 by H. Hausmanis/K. Bergen
reported: 2005/01/24 by K. Bergen

Result:

	Endpoint	Value	Confidence Limits	Units	Method Calculated
Acute: (mortality)	LC25	>100		%	estimated
	LC50	>100		%	estimated
	NOEC	100		%	estimated
	LOEC	>100		%	estimated
	MSD	could not be calculated			
Chronic: (growth)	IC25	>100		%	estimated
	IC50	>100		%	estimated
	NOEC	100		%	estimated
	LOEC	>100		%	estimated
	MSD	could not be calculated			

Notes: LCx & ICx, concentrations lethal or inhibitory to 'x' percent of the test population; NOEC & LOEC, no and lowest observed effect concentrations

Comments: The EC guidance document on the importation of test organisms (1999) has been followed. No unusual behaviour or appearance or treatment of test organisms was noted prior to shipping, upon arrival or preceding the test. Test organisms were received in good condition, with inflated swim bladders. No acclimation of test organisms was required. The mortality of the test organisms was <2%upon arrival, and before test initiation.

Our liability is limited to the cost of the test requested. No liability is assumed for the application and or interpretation of the test results.

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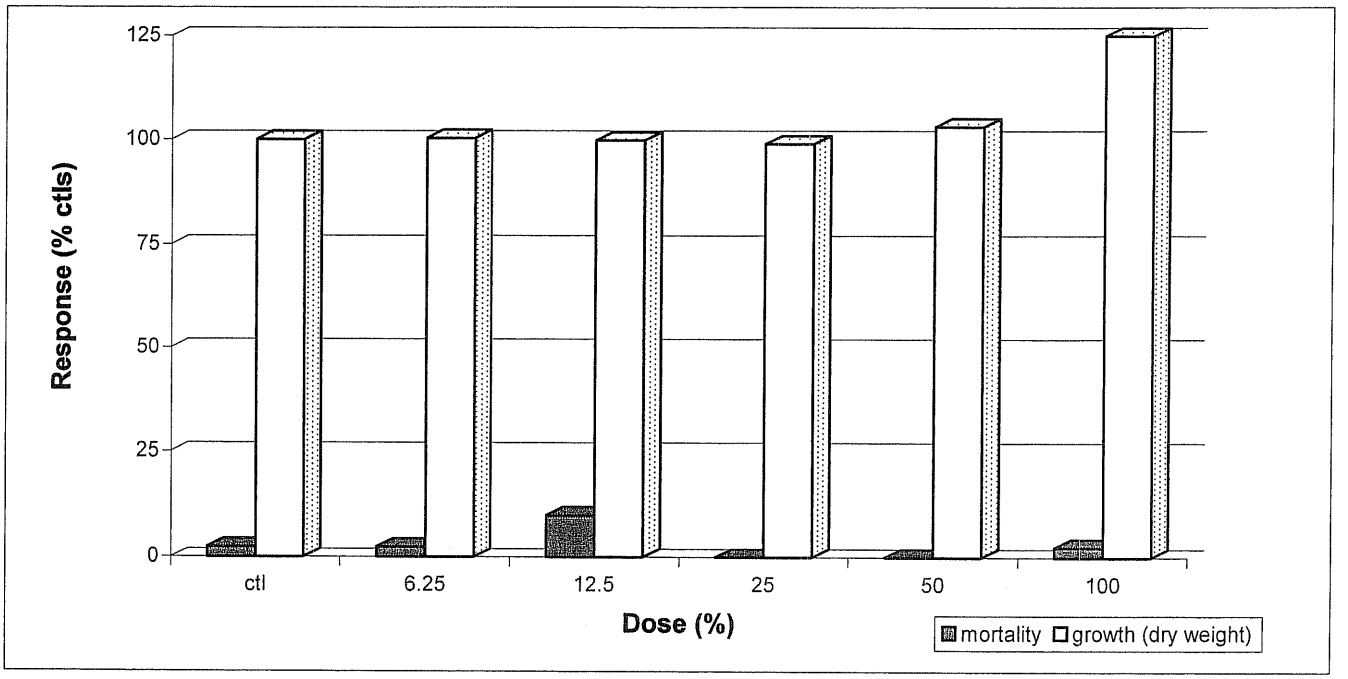
Test Report

Client:	ENV120	Sample:	20050029	Test:	20050098



Test Design

Organism: *Pimephales promelas* Source: Aquatox Inc. Age: < 24 hour post hatch
Breeding stock mortality was less than five percent during the week prior to test initiation.
The tests were conducted in 500 mL plastic vessels with 250 mL volumes (depth of 6.5 cm).
The sample was diluted with dechlorinated City of Calgary water acclimated to the test conditions.

Sample Information

The test was conducted with three samples. Samples a, b, and c were for days 0 to 2, 3 to 4, and 5 to 7.
The sample was not preaerated, filtered or pH adjusted prior to testing or during testing.
The dissolved oxygen concentration (mg/L) was 7.3 The sample pH was 8.8

Test Log

Date	Day	Time	Technicians	Comments
2005/01/07	0	1545	K. de Windt/H. Hausmanis	Test organisms appear normal.
2005/01/08	1	1250	K. Steele	Test organisms appear normal.
2005/01/09	2	1300	K. Steele	Test organisms appear normal.
2005/01/10	3	1630	K. Steele/S. Goudey	Test organisms appear normal.
2005/01/11	4	1400	B. Crago	Test organisms appear normal.
2005/01/12	5	1515	H. Hausmanis	Test organisms appear normal.
2005/01/13	6	1430	H. Hausmanis	Test organisms appear normal.
2005/01/14	7	1600	H. Hausmanis/K. Bergen	Test organisms appear normal.

The test data and results are verified correct. Kirbi Steele

Authorized by K.Steele, B.Sc., Quality Assurance Officer

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Test Report

Test Data

Client: ENV120	Sample: 20050029	Test: 20050098

Chemistry

pH (units)

dose (%) / day	New Solutions ctl	6.25	12.5	25	50	100		Old Solutions ctl	6.25	12.5	25	50	100	
0	7.9	8.1	8.2	8.4	8.6	8.8								
1	8.0	8.1	8.2	8.4	8.7	8.8		8.2	8.2	8.2	8.3	8.5	8.7	
2	8.1	8.2	8.2	8.4	8.7	8.8		8.3	8.2	8.2	8.3	8.5	8.7	
3	8.1	8.0	8.2	8.4	8.7	8.8		8.1	8.1	8.2	8.2	8.4	8.6	
4	7.9	8.1	8.2	8.3	8.5	8.7		8.1	8.1	8.1	8.1	8.3	8.5	
5	8.1	8.2	8.3	8.5	8.6	8.8		8.1	8.1	8.1	8.2	8.3	8.6	
6	8.0	8.1	8.2	8.3	8.6	8.8		8.1	8.0	8.1	8.1	8.3	8.6	
7								8.1	8.1	8.1	8.2	8.2	8.5	
8														

conductance (uS/cm)

0	470	528	627	858	1277	2290								
1	519	588	701	910	1351	2320		436	531	634	858	1275	2270	
2	440	567	710	919	1352	2300		499	576	688	907	1337	2350	
3	462	624	686	885	1361	2330		501	570	730	1008	1363	2280	
4	508	592	691	867	1282	2310		512	608	698	938	1386	2370	
5	491	591	698	910	1323	2270		544	628	722	924	1364	2390	
6	507	584	682	894	1339	2290		524	607	723	938	1378	2360	
7								507	618	725	946	1380	2350	
8														

dissolved oxygen (mg/L)

0	7.5	7.3	7.3	7.3	7.3	7.3								
1	7.4	7.3	7.3	7.3	7.3	7.3		6.6	6.5	6.5	6.6	6.5	6.6	
2	7.4	7.5	7.4	7.4	7.5	7.5		6.5	6.6	6.6	6.7	6.6	6.5	
3	7.4	7.4	7.4	7.3	7.3	7.6		6.5	6.4	6.4	6.4	6.3	6.4	
4	7.6	7.6	7.6	7.7	7.7	7.6		6.6	6.6	6.5	6.5	6.5	6.5	
5	7.2	7.2	7.3	7.3	7.3	7.3		5.9	5.9	5.8	5.7	5.6	5.6	
6	7.7	7.5	7.5	7.5	7.5	7.4		6.1	6.1	6.0	5.9	5.8	6.1	
7								6.9	6.8	6.7	6.9	6.6	6.7	
8														

temperature (°C)

0	24	24	24	24	24	24								
1	24	24	24	24	24	24		24	24	24	24	24	24	
2	24	24	24	24	24	24		24	24	24	24	24	24	
3	24	24	24	24	24	24		24	24	24	24	24	24	
4	24	24	24	24	24	24		24	24	24	24	24	24	
5	24	24	24	24	24	24		24	24	24	24	24	24	
6	24	24	24	24	24	24		24	24	24	24	24	24	
7								24	24	24	24	24	24	
8														

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Test Report

Test Data

Client: ENV120	Sample: 20050029	Test: 20050098

Biology (number alive)

dose (%)	ctl	6.25	12.5	25	50	100		ctl	6.25	12.5	25	50	100	
replicate	day 1							day 5						
a	10	10	10	10	10	10		10	10	10	10	10	9	
b	10	10	10	10	10	10		10	9	10	10	10	10	
c	10	10	10	10	10	10		9	10	10	10	10	10	
d	10	10	10	10	10	10		10	10	6	10	10	10	
	day 2							day 6						
a	10	10	10	10	10	10		10	10	10	10	10	9	
b	10	10	10	10	10	10		10	9	10	10	10	10	
c	10	10	10	10	10	10		9	10	10	10	10	10	
d	10	10	10	10	10	10		10	10	6	10	10	10	
	day 3							day 7						
a	10	10	10	10	10	9		10	10	10	10	10	9	
b	10	9	10	10	10	10		10	9	10	10	10	10	
c	9	10	10	10	10	10		9	10	10	10	10	10	
d	10	10	8	10	10	10		10	10	6	10	10	10	
	day 4							dry weights (mg)						
a	10	10	10	10	10	9		4.7	5.6	5.0	5.2	6.1	6.1	
b	10	9	10	10	10	10		5.5	5.6	5.1	5.2	5.8	6.8	
c	9	10	10	10	10	10		5.1	5.0	5.7	5.0	5.6	6.2	
d	10	10	6	10	10	10		5.2	4.4	3.2	5.5	4.4	6.7	

Summary Tables

	Mortality (%)						Growth Data (mg per fish)					
a	0	0	0	0	0	10	0.5	0.6	0.5	0.5	0.6	0.7
b	0	10	0	0	0	0	0.5	0.6	0.5	0.5	0.6	0.7
c	10	0	0	0	0	0	0.6	0.5	0.6	0.5	0.6	0.6
d	0	0	40	0	0	0	0.5	0.4	0.5	0.5	0.4	0.7
mean	3	3	10	0	0	3	0.5	0.5	0.5	0.5	0.5	0.7
sd	5	5	20	0	0	5	0.0	0.1	0.0	0.0	0.1	0.0
cv(%)	200	200	200	0	0	200	8	15	6	3	14	5

Growth as a Percent of Controls

100	100	100	99	103	125

Chemistry

dose (%)	New Solutions: ctl	6.25	12.5	25	50	100		Old Solutions: ctl	6.25	12.5	25	50	100	
	Average Values													
pH	8.0	8.1	8.2	8.4	8.6	8.8		8.1	8.1	8.1	8.2	8.4	8.6	
EC	485	582	685	892	1326	2301		503	591	703	931	1355	2339	
DO	7.5	7.4	7.4	7.4	7.4	7.4		6.4	6.4	6.4	6.4	6.3	6.3	
temp	24	24	24	24	24	24		24	24	24	24	24	24	
	Variance (%)													
pH	1	1	0	1	1	0		1	1	1	1	1	1	
EC	6	5	4	3	3	1		7	6	5	5	3	2	
DO	2	2	2	2	2	2		5	5	5	7	6	6	
temp	0	0	0	0	0	0		0	0	0	0	0	0	

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Quality Assurance Information

Test Method: 72 hours Algal Growth Inhibition Test (IC50, five or more treatments plus a control)
HydroQual Test Method Manual, section: 4.4.2.7

Reference: Biological Test Method: Growth Inhibition Test Using the Freshwater Alga *Selenastrum capricornutum*, 1992. Environment Canada, EPS 1/RM/25, with Nov., 1997 amendments

Test Organism		Test Design	
test species	*Raphidocelis subcapitata*	**test type**	static
(formerly)	*Selenastrum capricornutum* (strain LB37)	**toxicant**	zinc
		test vessel	96 well flat bottom microplate
original source	ATCC	**test volume (uL)**	220
culture vessels	2L Erlenmeyer flask	**no. of replicates**	3
water source	deionized water	**no. of replicate wells/treatment (per plate)**	5
growth medium	nutrient solution	**control**	10
cultivation method	batch as per test conditions	**mean temperature (°C)**	24 ± 2°C
culture condition at start of test	normal	**photoperiod**	continuous light
culture age	4-7 days	**light level**	4000 lux ± 10%
		contol/dilution water	deionized water and nutrients (prepared as per EPS1/RM/25)

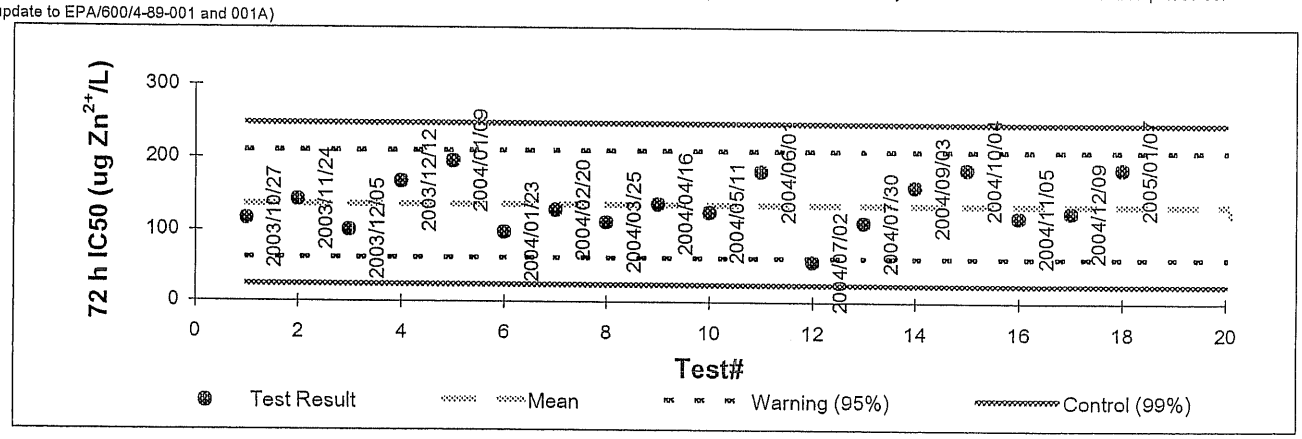
Qualty Assurance Unit:
The test data and result are verified correct.

Kirbi Steele 2005/01/09
Authorized by: K. Steele

Algae Warning Chart (growth IC50 at 72 hours)

Toxicant: Zinc ($ZnSO_4{}^*7H_2O$)
Current Test: **started:** 2005/01/04 **ended:** 2005/01/07
Result (72 h IC50): 187 (144-228) ug Zn^{2+}/L 95% confidence limits are in brackets
Historical Mean: 137 **std.dev:** 37 **CV(%):** 27
Chart Limits: **warning:** 62 211 **control:** 25 248
95% , two standard deviations 99%, three standard deviations

Statistical analysis perfomed by ICPIN, West, Inc. and D. D. Gulley, 1994. Toxstat 3.4. Western Eco-Systems Technology, Inc., Cheyenne, and Toxstat, Norberg-King, T.J. 1993.
A Linear Interpolation. Method for Sublethal Toxicity: The Inhibition Concentration Approach (Ver. 2.0). National Effluent Toxicity Assessment Centre Technical Report 03-93. (update to EPA/600/4-89-001 and 001A)



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Mann-Kendall Trend Analysis Information

Sample: 20050029	Test: 20050097

Control Absorbancies of the D row

Column	Adjacent to Treatment (%)	OD (430 nm)
2	ctl	0.097
3	100	0.091
4	100	0.106
5	50	0.104
6	25	0.112
7	12.5	0.107
8	6.3	0.102
9	3.1	0.099
10	1.6	0.107
11	ctl	0.100
	average	0.102
	stdev	0.0059
	cv(%)	5.8

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Quality Assurance Information

Test Method: *Ceriodaphnia* Survival and Reproduction Test (5 treatments plus a control)
HydroQual Test Method Manual, section: 4.4.3.2

Reference: Biological Test Method: Test of Reproduction and Survival Using the Cladoceran *Ceriodaphnia dubia*, 1992. Environment Canada, EPS 1/RM/21 including November, 1997 amendments.

Test Organism

test species	*Ceriodaphnia dubia*
culture source	in-house
original culture source	Environment Canada
ephippia in stock culture	none
mortality in culture	7
culture fecundity	28(mean young/adult)
young produced in previous brood	10
food type	YAT:Algae
frequency of feeding	daily
condition prior to test initiation	normal
age of test organisms	<24 hours

*note: there are 2 subcultures within this culture source, separated by one week in age.

The test is set with organisms from one subculture. The number of young a culture has is monitored daily.
If young are not used that day, they are discarded, therefore organisms in tests are <24h.

Test Design

test type	static renewal
toxicant	sodium chloride (NaCl)
test vessel	30 mL plastic cup
test volume (mL)	15
replicates per treatment	10
organisms per replicate	1
feeding	daily
temperature (°C)	24-26
photoperiod	16 hours light: 8 hours dark
light level (surface)	100-600 lux
hardness adjustment	no

Control/Dilution Water

source	equal volumes of Bow River water and moderately hard reconstituted water (50:50)
pH (units)	8.4
conductance (uS/cm)	500
dissolved oxygen (mg/L)	7.3
NH_4^+ (mg/L)	<0.1
hardness (mg $CaCO_3$/L)	150
alkalinity (mg $CaCO_3$/L)	133
total residual chlorine (mg/L)	<0.01

moderately hard reconstituted water prepared as per EPS 1/RM/21

Quality Assurance Unit:
The test data and results are verified correct. Kathi Steele 2005/01/11
Authorized by: K. Steele

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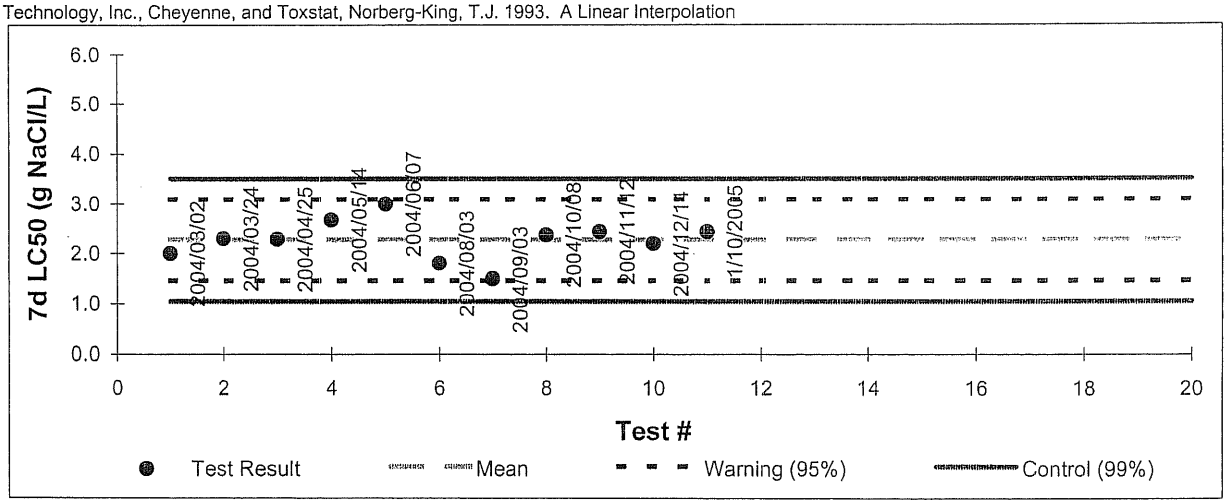
Quality Assurance Information

Ceriodaphnia dubia Warning Chart (Mortality: LC50 at 7 days)

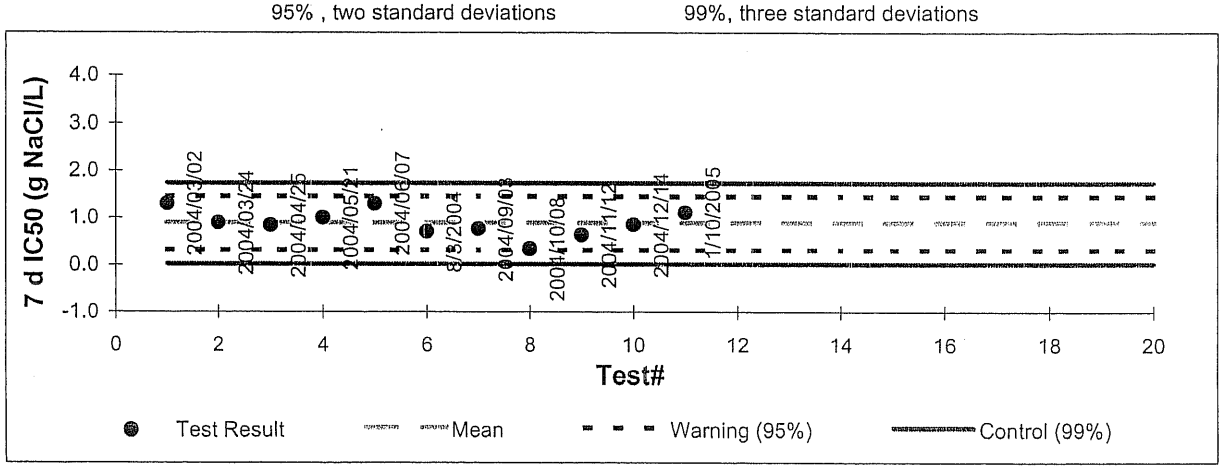
Toxicant:	Sodium Chloride (NaCl)					
Current Test:	**started:**	2005/01/03	**ended:**	2005/01/10		
Result (7 d LC50):	2.4	(1.6-2.7)	g NaCl/L	95% confidence limits are in brackets		
Historical Mean:	2.3	**std dev:**	0.4	**CV (%):**	18	
Chart Limits:	**warning:**	1.5	3.1	**control:**	1.0	3.5
	95% , two standard deviations			99%, three standard deviations		

Statistical analysis perfomed by ICPIN, West, Inc. and D. D. Gulley, 1994. Toxstat 3.4. Western Eco-Systems Technology, Inc., Cheyenne, and Toxstat, Norberg-King, T.J. 1993. A Linear Interpolation



Ceriodaphnia dubia Warning Chart (Reproduction: IC50 at 7 days)

Toxicant:	Sodium Chloride (NaCl)					
Current Test:	**started:**	2005/01/03	**ended:**	2005/01/10		
Result (7d IC50):	1.1	(0.9-1.2)	g NaCl/L	95% confidence limits are in brackets		
Historical Mean:	0.9	**std dev:**	0.3	**CV (%):**	32	
Chart Limits:	**warning:**	0.3	1.5	**control:**	0.0	1.7
	95% , two standard deviations			99%, three standard deviations		



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Reference Toxicant
Ceriodaphnia Culture Log

Adults live	7 d ago	day used
	42	39

day prior to use		row/replicate	1	2	3	4	5	6	7	8	9	10	11
			A5	A6	A7	B5	B6						
7	number of young		0	3	5	9	1						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
6	number of young		8	9	8	7	10						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
5	number of young		8	12	8	8	8						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
4	number of young		2	2	0	12	0						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
3	number of young		8	12	8	10	10						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
2	number of young		2	2	2	8	0						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
DAY USED 2005/01/03	number of young		16	19	20	23	17						
	number of adults		2	2	2	2	2						
			A5	A6	A7	B5	B6						
totals			22	29.5	25.5	38.5	23						

number of young produced per organism in the last brood before use: 10

mean number of surviving young per adult over the last seven days: 28

culture mortality over the last seven days: 7

water type was equal mixture of moderately hard reconstituted water and Bow River Water (50:50)

less than 24 h organisms were used in the test with the reference toxicant

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Ceriodaphnia Culture Log

Adults live	7 d ago	day used
	42	39

Sample 20050029

day prior to use	row/replicate	1	2	3	4	5	6	7	8	9	10	11
		B2	D3	D6	E2	E6	E7					
7	number of young											
	number of adults											
		B2	D3	D6	E2	E6	E7					
6	number of young											
	number of adults											
		B2	D3	D6	E2	E6	E7					
5	number of young											
	number of adults											
		B2	D3	D6	E2	E6	E7					
4	number of young	8	8	10	7	9	8					
	number of adults	2	2	2	2	2	2					
3	number of young	4	7	0	1	6	4					
	number of adults	2	2	2	2	2	2					
		B2	D3	D6	E2	E6	E7					
2	number of young	8	6	12	11	4	8					
	number of adults	2	2	2	2	2	2					
		B2	D3	D6	E2	E6	E7					
DAY USED 2005/01/07	number of young	12	12	14	15	15	13					
	number of adults	2	2	2	2	2	2					
		B2	D3	D6	E2	E6	E7					
totals		16	17	18	17	17	17					

number of young produced per organism in the last brood before use: 7

mean number of surviving young per adult over the last seven days: 17

culture mortality over the last seven days: 7

water type was equal mixture of moderately hard reconstitued water and Bow River Water (50:50)

less than 24 h organisms were used in the test on the sample

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Quality Assurance Information

Test Method: 7 days Fathead minnow Survival and Growth Test (five treatments plus a control)
HydroQual Test Method Manual, section: 4.4.4.6

Reference: Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnow, 1992. Environment Canada, EPS 1/RM/22, with Nov. 1997 amendments.

Test Organism

test species	*Pimephales promelas*
culture source	Aquatox Inc. (Arkansas, USA)
temp of breeding aquaria	23 - 26 °C
food type	frozen brine shrimp
frequency of feeding	daily
breeding colony mortality	<5% (last 7 days)
age of test organisms	<24 hours
condition prior to test initiation	normal
batch number	20050107FM

Test Design

test type	static renewal
toxicant	sodium chloride
test vessel	polypropelyene cups, 11x9 cm
volume of test vessel	450
test volume (ml)	250
depth of test solution	>3 cm
replicates per treatment	4 replicates
organisms per replicate	10
feeding	twice daily
temperature (°C)	24-26
photoperiod	16 hours light: 8 hours dark
light level (surface)	100-500 lux

Control/Dilution Water

source	dechlorinated City of Calgary tap water no chemicals were added to the dilution water
pH (units)	8.0
conductance (uS/cm)	410
dissolved oxygen (mg/L)	7.6
NH_4^+ (mg/L)	<0.1
hardness (mg $CaCO_3$/L)	206
alkalinity (mg $CaCO_3$/L)	169
total residual chlorine (mg/L)	<0.01

Quality Assurance Unit:
The test data and results are verified correct.

K. Steele 2005/01/21
Authorized by: K. Steele

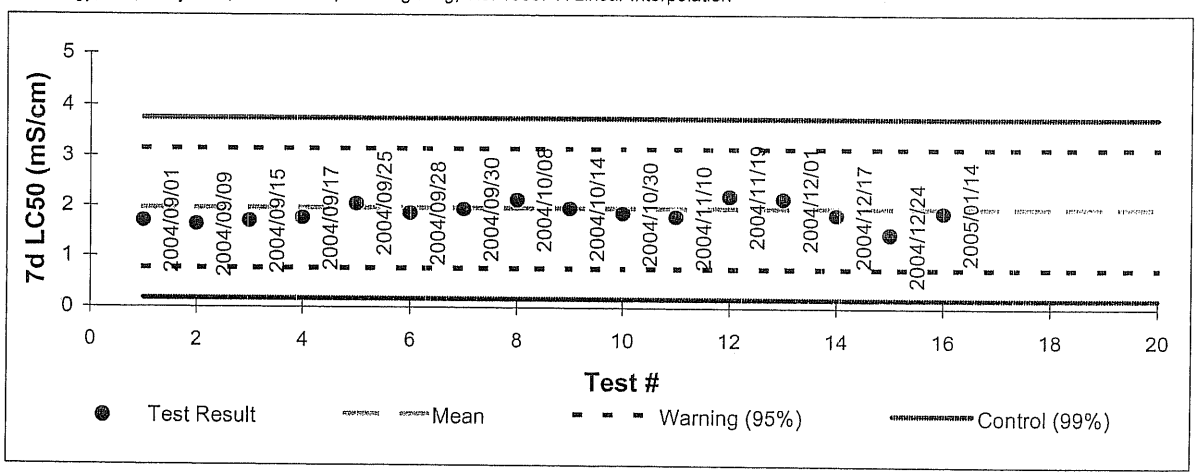
HydroQual Laboratories Ltd.
#3, 6125 12th Street SE Calgary, Alberta Canada T2H 2K1
Tel (403) 253-7121 Fax (403) 252-9363 www.hydroqual.ca

Quality Assurance Information

Fathead minnow Warning Chart (Mortality: LC50 at 7 days)

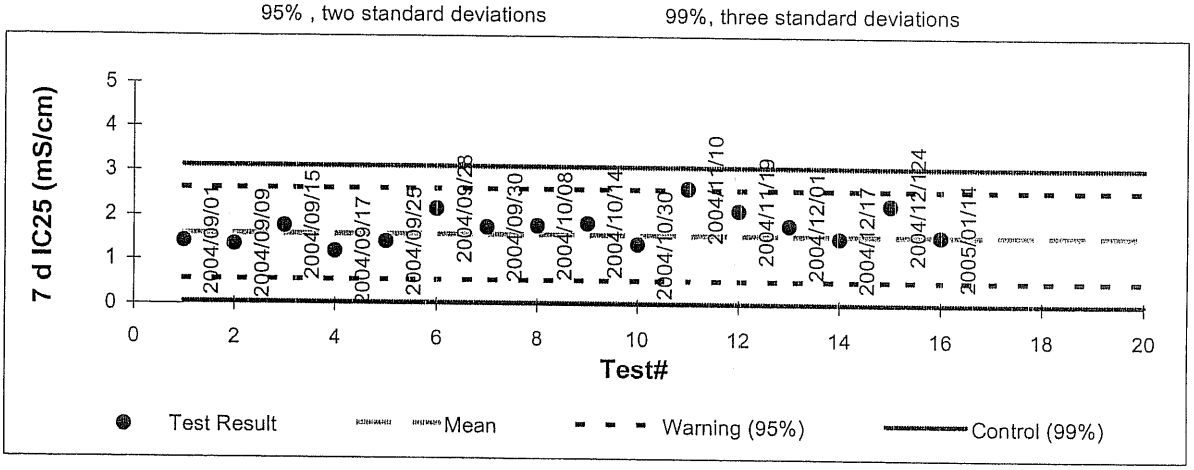
Toxicant:	Sodium Chloride (NaCl)					
Current Test:	**started:**	2005/01/07	**ended:**	2005/01/14		
Result (7 d LC50):	1.9	(1.7-2.0)	mS/cm	95% confidence limits are in brackets		
Historical Mean:	2.0	**std dev:**	0.6	**CV (%):**	30	
Chart Limits:	**warning:**	0.8	3.1	**control:**	0.2	3.7
	95% , two standard deviations			99%, three standard deviations		

Statistical analysis perfomed by ICPIN, West, Inc. and D. D. Gulley, 1994. Toxstat 3.4. Western Eco-Systems Technology, Inc., Cheyenne, and Toxstat, Norberg-King, T.J. 1993. A Linear Interpolation



Fathead minnow Warning Chart (Growth: IC25 at 7 days)

Toxicant:	Sodium Chloride (NaCl)					
Current Test:	**started:**	2005/01/07	**ended:**	2005/01/14		
Result (7d IC25):	1.6	(1.3-1.8)	mS/cm	95% confidence limits are in brackets		
Historical Mean:	1.6	**std dev:**	0.5	**CV (%):**	32	
Chart Limits:	**warning:**	0.6	2.6	**control:**	0.1	3.1
	95% , two standard deviations			99%, three standard deviations		



pH: 7.9
EC: 472
DO: 12.9
Temp: 22.1
Hrdt: 131

AQUATOX, INC.

100 Springwood Drive #15
Hot Springs, Arkansas 71913
(501) 767-9120

TEST ORGANISM HISTORY

20050107Fm

DATE SHIPPED F605 Hydrogeol

SPECIES Pimephales promelas

QUANTITY SHIPPED 750+

AGE/LIFE STAGE 24hrs 1-7-05 1500CST

BROODSTOCK SOURCE Aredale Farms, AR

CULTURE WATER Groundwater

ALKALINITY (Mg/l as $CaCO_3$) >80

HARDNESS (Mg/l as $CaCO_3$)/Salinity (ppt) =160

FEEDING Artemia

COMMENTS PO# 2005-001

PACKAGED BY CM

BILL HALL PRINTERS 3171

Rainbow Trout Bioassay Test Report – Pass/Fail

Sample Number: L237213-1

Summary Results

96-hour Pass/Fail:	Pass

Sample Information

Sample Origin:	Manitoba Hydro
Sample Description:	Ash Lagoon
Sampling Date and Time:	05/01/04 11:15
Sampling Method:	Grab
Sampled By:	Doug Johnson
Container(s) Description:	1 X 20 L Polyethylene pail w/liner
Sample Volume (L):	20 L
Date and Time Received:	05/01/06 10:20
Transit Irregularities:	None
Storage Temperature:	4

Test Information

Test Organism:	Oncorhynchus mykiss
Test Description:	Acute, 96-hour, Static, Pass/Fail
Reference Method:	EPS1/RM/13, 2nd Ed. Dec. 2000, Environment Canada
Performed By:	GT
Starting Date & Time:	05/01/06 14:30
Source of Holding/Dilution Water:	Dechlorinated UV treated city of Winnipeg tap water
Container Description:	Polyethylene pails w/disposable liners
Test Solution Volume (L):	20 L
Test Solution Depth (cm):	34 cm
Number of Test Organisms/Container:	10
Deviations from Reference Method:	None

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Winnipeg, MB R3E 3L5
(204) 945-3705

Condition of Sample Upon Arrival

Observations:

Colour:	Greenish gray
Odour:	None
Turbidity:	Moderate
Solids:	None
Temperature (°C):	8.8
pH:	8.87
pH Adjustment:	Not Adjusted
Conductivity at 25°C (umhos/cm):	2220
Dissolved Oxygen (mg/L):	12.6

Pre-Aeration

Duration at 6.5 – 7.0 mL/min/L (min):	120	
Sample Test Concentration (v/v):	100%	0%
Before Pre-Aeration Dissolved Oxygen (% sat.):	111.5	96.5
After Pre-Aeration Dissolved Oxygen (% sat.):	104.7	91.7

Test Organism Data

Lot Number:	041026-T5
Weekly Mortality Preceding Test (%):	< 2
Average Fork Length +/- 1 SD (cm):	4.1
Average Mass +/- 1 SD (g):	0.52
Sample Size:	10
Loading Density (organisms/20mL):	0.26

Reference Toxicant

Toxicant:	Zinc Sulphate
Test Starting Date:	05/01/04
96-hour LC50 (mg/L ZnSO4):	0.45
95% Lower Confidence Interval (mg/L ZnSO4):	0.22
95% Upper Confidence Interval (mg/L ZnSO4):	0.61
Method of Calculation:	Stephan LC50 Program, Probit
Confirmed by Graph:	Yes
Historic Geometric Mean LC50 (mg/L ZnSO4):	0.70
95% Lower Confidence Interval (mg/L ZnSO4):	0.03
95% Upper Confidence Interval (mg/L ZnSO4):	1.37

Test Data

Time: 0 Hours

Sample Concentration v/v (%)	100	0
Temperature (°C)	13.6	14.5
PH	8.84	7.68
Conductivity at 25 °C (umhos/cm)	2220	177
Dissolved Oxygen (mg/L)	10.4	9.1

Time: 24 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Temperature (°C)	15.3	15.3
pH	8.71	7.78
Dissolved Oxygen (mg/L)	8.6	8.9

Time: 48 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Temperature (°C)	15.4	15.4
pH	8.69	7.79
Dissolved Oxygen (mg/L)	9.0	9.0

Time: 72 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Temperature (°C)	15.2	15.2
pH	8.70	7.80
Dissolved Oxygen (mg/L)	9.1	9.1

Time: 96 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Number of Dead Fish	0	0
Temperature (°C)	14.8	14.8
pH	8.52	7.88
Dissolved Oxygen (mg/L)	9.1	9.1

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Sublethal Biological Effects

No sublethal biological effects observed.

Observations/Comments

No toxicity observed.

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Rainbow Trout Bioassay Test Report – Pass/Fail

Sample Number: L244631-1

Summary Results

96-hour Pass/Fail:	Pass

Sample Information

Sample Origin:	Manitoba Hydro
Sample Description:	Ash Lagoon
Sampling Date and Time:	N/A
Sampling Method:	Grab
Sampled By:	N/A
Container(s) Description:	1 X 20 L Polyethylene pail w/liner
Sample Volume (L):	20 L
Date and Time Received:	05/02/09 13:00
Transit Irregularities:	None
Storage Temperature:	4

Test Information

Test Organism:	Oncorhynchus mykiss
Test Description:	Acute, 96-hour, Static, Pass/Fail
Reference Method:	EPS1/RM/13, 2nd Ed. Dec. 2000, Environment Canada
Performed By:	GT
Starting Date & Time:	05/02/10 14:00
Source of Holding/Dilution Water:	Dechlorinated UV treated city of Winnipeg tap water
Container Description:	Polyethylene pails w/disposable liners
Test Solution Volume (L):	20 L
Test Solution Depth (cm):	34 cm
Number of Test Organisms/Container:	10
Deviations from Reference Method:	None

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Condition of Sample Upon Arrival

Observations:

Colour:	Pale green
Odour:	None
Turbidity:	Slight
Solids:	None
Temperature (°C):	14.0
pH:	8.35
pH Adjustment:	Not Adjusted
Conductivity at 25°C (umhos/cm):	1890
Dissolved Oxygen (mg/L):	10.3

Pre-Aeration

Duration at 6.5 – 7.0 mL/min/L (min):	120	120
Sample Test Concentration (v/v):	100%	0%
Before Pre-Aeration Dissolved Oxygen (% sat.):	103.2	89.9
After Pre-Aeration Dissolved Oxygen (% sat.):	108.2	82.7

Test Organism Data

Lot Number:	041214-T6
Weekly Mortality Preceding Test (%):	< 2
Average Fork Length +/- 1 SD (cm):	4.4
Average Mass +/- 1 SD (g):	0.78
Sample Size:	10
Loading Density (organisms/20mL):	0.39

Reference Toxicant

Toxicant:	Zinc Sulphate
Test Starting Date:	05/01/31
96-hour LC50 (mg/L ZnSO4):	0.58
95% Lower Confidence Interval (mg/L ZnSO4):	0.46
95% Upper Confidence Interval (mg/L ZnSO4):	0.73
Method of Calculation:	Stephan LC50 Program, Probit
Confirmed by Graph:	Yes
Historic Geometric Mean LC50 (mg/L ZnSO4):	0.70
95% Lower Confidence Interval (mg/L ZnSO4):	0.03
95% Upper Confidence Interval (mg/L ZnSO4):	1.37

Test Data

Time: 0 Hours

Sample Concentration v/v (%)	100	0
Temperature (°C)	14.9	12.8
PH	8.33	7.45
Conductivity at 25 °C (umhos/cm)	1890	179
Dissolved Oxygen (mg/L)	10.6	9.2

Time: 24 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Temperature (°C)	17.9	16.6
pH	8.33	7.58
Dissolved Oxygen (mg/L)	7.5	8.1

Time: 48 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Temperature (°C)	16.5	16.1
pH	8.29	7.60
Dissolved Oxygen (mg/L)	7.7	8.0

Time: 72 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Temperature (°C)	15.9	16.0
pH	8.27	7.58
Dissolved Oxygen (mg/L)	7.8	8.0

Time: 96 Hours

Sample Concentration v/v (%)	100	0
% Stress	0	0
% Mortality	0	0
Number of Dead Fish	0	0
Temperature (°C)	13.0	13.3
pH	8.33	7.52
Dissolved Oxygen (mg/L)	7.9	8.0

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Sublethal Biological Effects

No sublethal biological effects observed.

Observations/Comments

No toxicity observed. Temperature out of range 15°C ± 1°C at 0, 24,48 and 96 hours. Control fish were unaffected.