CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G37010 **REPORT No. B13-22723**

Report To:

City of Iqaluit
PO Box 460,
Iqaluit NU X0A 0H0
Attention: Paul Clow

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 29-Aug-13
DATE REPORTED: 16-Sep-13
SAMPLE MATRIX: Waste Water

JOB/PROJECT NO.: Test B
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		WTP Test B			
			Sample I.D.		B13-22723-1			
			Date Collected		27-Aug-13			
Parameter	**Units**	**M.D.L.**	**Reference Method**	**Date/Site Analyzed**				
pH @25°C	pH Units		SM 4500H	30-Aug-13/O	7.44			
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Aug-13/O	488			
Total Suspended Solids	mg/L	3	SM 2540D	30-Aug-13/O	156			
Nitrite (N)	mg/L	0.1	SM4110C	29-Aug-13/O	< 0.1			
Nitrate (N)	mg/L	0.1	SM4110C	29-Aug-13/O	0.1			
Calcium	mg/L	0.02	SM 3120	30-Aug-13/O	30.9			
Magnesium	mg/L	0.01	SM 3120	30-Aug-13/O	4.60			
Sodium	mg/L	0.2	SM 3120	30-Aug-13/O	20.7			
Potassium	mg/L	0.1	SM 3120	30-Aug-13/O	8.7			
Aluminum (total)	mg/L	0.01	SM 3120	30-Aug-13/O	0.68			
Antimony	mg/L	0.0001	EPA 200.8	30-Aug-13/O	< 0.0001			
Arsenic	mg/L	0.0001	EPA 200.8	30-Aug-13/O	< 0.0001			
Barium	mg/L	0.001	SM 3120	30-Aug-13/O	0.042			
Beryllium	mg/L	0.002	SM 3120	30-Aug-13/O	< 0.002			
Bismuth	mg/L	0.02	SM 3120	30-Aug-13/O	< 0.02			
Boron	mg/L	0.005	SM 3120	30-Aug-13/O	0.035			
Cadmium	mg/L	0.005	SM 3120	30-Aug-13/O	< 0.005			
Chromium	mg/L	0.002	SM 3120	30-Aug-13/O	0.003			
Cobalt	mg/L	0.005	SM 3120	30-Aug-13/O	< 0.005			
Copper	mg/L	0.002	SM 3120	30-Aug-13/O	0.393			
Iron (Total)	mg/L	0.005	SM 3120	30-Aug-13/O	1.37			
Lead	mg/L	0.02	SM 3120	30-Aug-13/O	< 0.02			
Lithium	mg/L	0.005	SM 3120	30-Aug-13/O	< 0.005			
Manganese (Total)	mg/L	0.001	SM 3120	30-Aug-13/O	0.280			
Molybdenum	mg/L	0.01	SM 3120	30-Aug-13/O	< 0.01			
Nickel	mg/L	0.01	SM 3120	30-Aug-13/O	0.01			
Silicon	mg/L	0.01	SM 3120	30-Aug-13/O	1.77			
Silver	mg/L	0.005	SM 3120	30-Aug-13/O	< 0.005			

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

M.D.L. = Method Detection Limit
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill

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SAMPLE MATRIX: Waste Water

JOB/PROJECT NO.: Test B
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		WTP Test B			
			Sample I.D.		B13-22723-1			
			Date Collected		27-Aug-13			
Parameter	**Units**	**M.D.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	30-Aug-13/O	0.088			
Tin	mg/L	0.05	SM 3120	30-Aug-13/O	< 0.05			
Titanium	mg/L	0.005	SM 3120	30-Aug-13/O	0.010			
Uranium	mg/L	0.00005	EPA 200.8	30-Aug-13/O	0.00020			
Vanadium	mg/L	0.005	SM 3120	30-Aug-13/O	< 0.005			
Zinc	mg/L	0.005	SM 3120	30-Aug-13/O	0.245			
Ammonia (N)-Total	mg/L	0.01	MOEE 3364	04-Sep-13/O	34.8			
o-Phosphate (P)	mg/L	0.01	MOEE 3366	04-Sep-13/O	3.89			
Phosphorus-Total	mg/L	0.01	MOEE 3367	11-Sep-13/O	11.9			
BOD	mg/L	3	SM 5210B	30-Aug-13/O	169			
Total Coliform	cfu/100mL	1	MOE E3371	30-Aug-13/O	24000000			
Fecal Coliform	cfu/100mL	1	MOE E3371	29-Aug-13/O	1700000			

M.D.L. = Method Detection Limit
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

pollutech
enviroquatics limited

September 16, 2013

Greg Clarkin
Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa, ON K1V 7P1

Dear Greg:

On August 30, 2013, Pollutech EnviroQuatics Limited personnel received a water sample from Caduceon Environmental Laboratories (Test B B13-22723), Ottawa Site. The following acute toxicity tests were performed on this sample observing Environment Canada methods:

- Rainbow trout 96-hour single-concentration toxicity test according to the criteria outlined in the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Second Edition, Method Development and Applications Centre, Ottawa, ON., Report EPS 1/RM/13, 2000 (with 2007 amendments).

- *Daphnia magna* 48-hour LC50 toxicity test according to the criteria outlined in the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*", Environmental Technology Center, Ottawa, Ontario, Report EPS 1/RM/14 Second Edition, December 2000.

The results of the acute toxicity tests are summarized in Table 1.

Table 1 Summary of Acute Toxicity Results for Test B B13-22723 Water Sample Collected August 23, 2013

Sample Name Sample #	Toxicity Test	Endpoint	Effect	Result[1]
Test B B13-22723 #79911303	*Daphnia magna*	48-hour LC50 (95% Confidence)	Mortality	Non-lethal[2] (Not available)
	Rainbow Trout	96-hour Single-Concentration	Mortality	100% Mortality[2,3]

[1] – Results relate only to the sample tested
[2] – Test invalid – hold time was greater than five days. Tested as instructed.
[3] – Most regulations regard ≤50% mortality to be a "pass". Check your applicable regulatory requirements.

704 Mara Street, Suite 122, Point Edward, Ontario, Canada N7V 1X4 • T: 519.339.8787 • F: 519.336.6965
Email: info@pollutechgroup.com • www.pollutechgroup.com

Toxicity Test Endpoint Descriptions

LC50 The estimated concentration which causes acute lethality to 50% of the test organisms.

The following pages contain the required details for reporting of the acute lethality toxicity tests. If there are any further details which you require, please do not hesitate to contact us.

Sincerely,
Pollutech EnviroQuatics Limited

R. Clay Ferguson, B.Sc. (Hon.)
Laboratory Manager

File ID:\bioassay\2013\7000\7991\7991au1 T, D LC50

Rainbow Trout 96-Hour Single-Concentration Toxicity Test

METHOD: Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Second Edition, Method Development and Applications Section, Ottawa, ON., Report EPS 1/RM/13, 2000 (with 2007 amendments). Pollutech Test Method RT-SC-R1.2.

Test Material

Client Name/Location:	Caduceon Environmental Laboratories, Ottawa, ON		
Sample #:	79911303	**Sample Name:**	Test "B" B13-22723
Sample Method:	Grab	**Collected by:**	n/a
Date/Time Collected:	Aug. 23/13, 08:15	**Arrival Temp.:**	25.2°C
Date/Time Received:	Aug. 30/13, 14:30	**Sample Description:**	Cloudy brown
Sample Point Description:	Other	**Sample Type:**	Effluent
Transportation:	Road		
Storage:	Overnight at 15 ± 12 °C	In dark, no headspace	

n/a – not available

Test Organisms

Species:	Rainbow Trout (*Oncorhynchus mykiss*)				
Source:	Rainbow Springs Hatchery				
Culture Temp.:	15 ± 2°C	**Batch Number:**	RS072413		
Water Source:	Dechlorinated Municipal Drinking Water				
Mean Weight:	0.71 g	**Min:**	0.46 g	**Max:**	1.09 g
Mean Fork Length:	42.2 mm	**Min:**	37 mm	**Max:**	48 mm
Loading Density:	0.36 g/L	**Sample Size:**	10 fish		
Life Stage:	Fry				
Number Dead Daily In Previous 7 Days For Fish Culture:	0+0+2+1+0+4+4=11				
Previous 7-Day Holding Mortalities For Fish Culture:	1.15%				

Sample Number: 79911303 **Sample Name:** Test "B" B13-22723

Test Conditions

Date/Time Started:	Aug. 31, 2013, 13:00		
Test Volume:	20 L/Vessel	**Number of Fish Per Vessel:**	10
# of Vessels Per Conc.:	1	**Test Temperature:**	15 ± 1°C
Pre-aeration:	Yes	**Duration of Pre-aeration:**	120 minutes
Pre-aeration Rate:	6.5 ± 0.26 ml/min·L^{-1}	**Aeration Rate During Test:**	6.5 ± 0.26 ml/min·L^{-1}
Sample Adjustment:	No	**Sample pH Adjustment:**	No
Test Method Deviations:	Yes, sample hold time greater than five days.		

Test Facilities

CALA Testing Accreditation No. A1225

Testing Laboratory: Pollutech EnviroQuatics Limited, 704 Mara St., Suite 122, Point Edward, Ontario, N7V 1X4

This laboratory is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). The test included in this report is within the scope of this laboratory.

Test Performed By: C. Ferguson/C. D'Andrea/M. Long

Initial Measurement of Variables in Unadjusted Sample

Cond: 408 µmhos **pH:** 6.6 **O_2:** 0.2 mg/L **Temp:** 15.3°C

Test Results

NUMBER OF MORTALITIES

	Rep.No.			Time (hours)			
Conc'n		1	4	24	48	72	96
100%	1	1	9	10	-	-	-
Control	1			0	0	0	0

Number of Control Fish Showing Atypical/Stressed Behaviour: 0

pollutech enviroquatics limited

Sample Number: 79911303 **Sample Name:** Test "B" B13-22723

Test Results

TOXICITY TEST VARIABLES

Conc'n	Rep. No.	Variables	Time (hours) 0	24	48	72	96
100%	1	Cond. (µmhos)	404				n/r
		O_2 (mg/L)	4.3				7.6
		pH (units)	7.1				7.7
		Temp. (°C)	15.4				16.1
Control	1	Cond. (µmhos)	184				n/r
		O_2 (mg/L)	10.4				7.9
		pH (units)	7.8				7.5
		Temp. (°C)	15.4				16.3

n/r = not required

Summary of Test Results

Mean Mortality Rate: 100%[1] **Test Results Verified By:** R. C. Ferguson

[1] - Most regulations regard ≤50% mortality to be a "pass". Check your applicable regulatory requirements.

Reference Toxicant Results

Reference Chemical: Zinc **Date Test Initiated**: 08/20/13

Fish Lot #: RS072413

Method: Spearman-Karber (α = 10%)

96-Hour LC50 (95% Confidence Limits): 0.58 mg/L (0.44 mg/L; 0.78 mg/L)

Historic Geometric Mean LC50: 0.35 mg/L (0.18 mg/L; 0.67 mg/L)
(Historic Warning Limits) (± 2 Standard Deviations)

Daphnia magna 48-Hour Single*Daphnia magna* 48-Hour LC50 Toxicity Test

METHOD: Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*", Method Development and Applications Section, Ottawa, ON., Report EPS 1/RM/14, Second Edition, December 2000. Pollutech Test Method DM-LC-R10.7.

Test Material

Client Name/Location:	Caduceon Environmental Laboratories, Ottawa, ON		
Sample #:	79911303	**Sample Name:**	Test "B" B13-22723
Sample Method:	Grab	**Collected by:**	n/a
Date/Time Collected:	Aug. 23/13, 08:15	**Arrival Temp.:**	25.2°C
Date/Time Received:	Aug. 30/13, 14:30	**Sample Description:**	Cloudy brown
Sample Point Description:	Other	**Sample Type:**	Effluent
Transportation:	Road		
Storage:	4 ± 2 °C	In dark, no headspace	

n/a not available

Test Organisms

Species:	*Daphnia magna*	**Source:**	Pollutech Culture (MOE/EPA)
Culture Temp.:	20 ± 2°C	**Age:**	< 24-hours old
Water Source:	Reconstituted dechlorinated tap water		
Cultures Used in Testing:	63 SA		
Days to First Brood:	8		
Average # Number of Neonates/Brood:	39		
Previous 7 Days Mortality in Culture:	0%		

Test Facilities

Testing Laboratory: Pollutech EnviroQuatics Limited, 704 Mara St., Suite 122, Point Edward, Ontario, N7V 1X4

CALA Testing Accreditation No. A1225

This laboratory is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). The test included in this report is within the scope of this laboratory.

Test Performed By: M. Long

pollutech enviroquatics limited

Sample Number: 79911303 **Sample Name:** Test "B" B13-22723

Test Conditions

Date/Time Started:	Sept. 01/13, 09:05	**# of Neonates/Vessel:**	3
Test Volume:	50 mL/Vessel	**mL Solution/Neonate:**	16.7 mL
Reps/Concentration:	4	**Dilution Water:**	DW13-72
Pre-aeration:	Yes	**Pre-aeration Rate:**	50 ± 2 ml/min·L^{-1}
Pre-aeration Duration:	30 minutes	**Test Temperature:**	20 ± 2°C
Sample pH Adjustment:	No	**Sample pH Adjustment Procedure:**	N/A
Sample Hardness Adjustment:		No	
Hardness Before and After Adjustment:		Not Applicable	
Test Method Deviations:		Yes, sample hold time greater than five days.	

Initial Measurement of Variables of Unadjusted, Undiluted Sample

pH: 7.0 **O_2:** 0.3 mg/L **Cond:** 450 µmhos **Temp:** 19.8°C

Test Results

TOXICITY TEST VARIABLES

Concentration (% Volume)	pH		Oxygen mg/L		Cond. µmhos	Hardness mg/L	Temperature C°	
	Initial	Final	Initial	Final	Initial	Initial	Initial	Final
Control	8.1	8.1	8.9	8.6	530	198	20.3	20.4
6.25	7.9	7.9	8.8	7.9	521	--	20.4	20.3
12.5	7.8	7.8	8.6	7.0	515	--	20.4	20.2
25	7.6	7.7	7.9	5.5	505	--	20.4	20.2
50	7.5	7.6	6.4	3.8	489	--	20.4	20.3
100	7.1	7.6	2.7	1.5	440	60	20.0	20.3

Sample Number: 79911303 **Sample Name:** Test "B" B13-22723

Test Results - continued

DAPHNIA OBSERVATIONS

Concentration (% Volume)	Test Vessel	Number of Daphnia Immobile 24 hr.	48 hr.	Number of Daphnia Dead 48 hr.
Control	A	0	0	0
	B	0	0	0
	C	0	0	0
	D	0	0	0
6.25	A	0	0	0
	B	0	0	0
	C	0	0	0
	D	0	0	0
12.5	A	0	0	0
	B	0	0	0
	C	0	0	0
	D	0	0	0
25	A	0	0	0
	B	0	0	0
	C	0	0	0
	D	0	0	0
50	A	0	0	0
	B	0	0	0
	C	0	0	0
	D	0	0	0
100	A	0	0	0
	B	0	0	0
	C	0	0	0
	D	0	0	0

Sample Number: 79911303 **Sample Name:** Test "B" B13-22723

Summary of Test Results

48-Hour LC50: Non-lethal

95% Confidence Limits: Not applicable

Analysis Method: No mortality

Results Verified By: R. C. Ferguson

Reference Toxicant Results

Reference Chemical: Phenol **Date Test Initiated**: 08/27/13

Method: Spearman-Karber (α = 0%)

48-Hour LC50 (95% Confidence Limits): 17.68 mg/L (14.32 mg/L; 21.83 mg/L)

Historic Geometric Mean LC50: 17.44 mg/L (8.97 mg/L; 33.91 mg/L)
(Historic Warning Limits) (± **2 Standard Deviations)**

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TESTING REQUIREMENTS

- ☐ O.Reg 153/09 — Table ____
- ☐ Surface Soil — ☐ Sub Surface Soil (O.Reg 153/09)
- ☐ Yes ☐ No — Record of Site Condition (O.Reg 153/09)
- ☐ Provincial Water Quality Objectives
- ☐ Sewer Use By-Law: ____
- ☐ MISA Guidelines
- ☐ O.Reg 558 Leachate Analysis
- Disposal Site: ____
- ☐ Landfill Monitoring
- ☐ Other: ____

REPORT NUMBER (Lab Use)

Indicate Laboratory Samples are submitted to: ☐ Kingston ☒ Ottawa ☐ Richmond Hill ☐ Windsor

Organization: City of Iqaluit	Address and Invoicing Address (if different): Invoice, Tracey Oram, P.O. Box 460, Iqaluit, NU X0A 0H0
Contact: Paul Clow	
Tel: 867-979-5363 x 233	
Fax:	Quote No.: Quotes attached. / Project Name:
Email: P.clow@city.iqaluit.nu.ca	P.O. No.: / Additional Info:

ANALYSES REQUESTED (Print Test in Boxes)

See Attached Quote Test A	See Attached Quote Test B	See Attached Quote Test E	See Attached Quote Test F	See Attached Quote V13-Radon Quote	Suspected Highly Contaminated

TURNAROUND SERVICE REQUESTED (see back page)

- ☐ Platinum 200% Surcharge**
- ☐ Gold 100% Surcharge
- ☐ Silver 50% Surcharge
- ☐ Bronze 25% Surcharge
- ☒ Standard 5-7 days
- ☐ Specific Date: ____

Are any samples to be submitted intended for Human Consumption under any Drinking Water Regulations? ☐ Yes ☒ No (If yes, submit all drinking water samples on a drinking water Chain of Custody)

* Sample Matrix Legend: WW=Waste Water SW=Surface Water GW=Groundwater LS=Liquid Sludge SS=Solid Sludge S=Soil Sed=Sediment PC=Paint Chips F=Filter Oil = Oil

Lab No:	Sample Identification	Sample Matrix *	Date Collected (yy-mm-dd)	Time Collected	Indicate Test For Each Sample By Using A Check Mark In The Box Provided	Field pH	Field Temp.	# Bottles Sample	Field Filtered(Y/N)
	Test A	WW	13/08/27	8:40AM	✓ ✓ → B13-22716			8	
	Test B	|	13/08/27	8:15AM	✓ → B13-22723			5	
	Test E	|	13/08/27	8:30AM	✓ → B13-22724			5	
	Test F	SW	13/08/27	8:15AM	✓ → B13-22726			5	

SAMPLE SUBMISSION INFORMATION

	Sampled by:	Submitted by:
Print:	Paul Clow	
Sign:		
	13/08/27 8:40AM	
	Date (yy-mm-dd)/Time:	Date (yy-mm-dd)/Time:

SHIPPING INFORMATION

- Client's Courier ☐
- Caduceon's Courier ☐
- Drop Off ☐
- Caduceon (Pick-up) ☑
- Invoice ☐
- # of Pieces 3 (1 cooler 2 buckets)

REPORTING / INVOICING

- Report by Fax ☐
- Report by Email ☑
- Invoice by Email ☐
- Invoice by Mail ☑

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

- Received By (print): Rebecca Signature:
- Date Received (yy-mm-dd): 13-08-29 Time Received: 14:00
- Laboratory Prepared Bottles: ☒ Yes ☐ No
- Sample Temperature °C: 12 °C Labeled by:
- Comments: 4 Lect, 1 1L R, 4 PET, 5 m, 4 TSS, 2 DOC, 3 NP/SSS

Page ____ of ____

G 37010

Laboratory Location/Shipping Addresses

Kingston Lab - 285 Dalton Ave., Kingston, ON K7K 6C1, Tel: (613) 544-2001 Fax: (613) 544-2770 Email: contactkingston@caduceonlabs.com
Ottawa Lab - 2378 Holly Lane, Ottawa, ON K1V 7P1, Tel: (613) 526-0123 Fax: (613) 526-1244 Email: contactottawa@caduceonlabs.com
Richmond Hill Lab - #14-110 West Beaver Creek Rd., ON L4B 1L9, Tel: (289) 475-5442 Fax: (866) 562-1963 Email: contactrichmondhill@caduceonlabs.com
Windsor Lab - #5-3201 Mannette Ave., Windsor, ON N8X 4G3, Tel: (519) 966-3541 Fax: (519) 966-3567 Email: contactwindsor@caduceonlabs.com

White: Lab Copy / Yellow: Invoicing Copy / Pink: Client Copy

CofC., Sep 2012, Revision No: 15

GF-10/12

CADUCEON™
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QUOTATION FOR ANALYTICAL SERVICES

Quote # :	**Y13_TEST_B**
Organization:	**City of Iqaluit**
Contact:	Sean Tiessen
Telephone:	867-979-5649
Facsimile:	
Email:	S.Tiessen@city.iqaluit.nu.ca
Project #:	**Test B WWTP Inffluent**
Address:	P.O. Box 460 Iqaluit, Nunavut X0A 0H0
Additional Info:	QUOTE # ('S) MUST BE ON C OF C TO APPLY if not listed, General pricing will be applied.
Additional Info:	1 Event a year (Summer(A, B, E, F))
Date:	January 10, 2013 **Valid Until:** December-31-13

Item #	Quantity	Analysis Request	Matrix	Unit Cost, $	Amount, $
1	1	BOD ✓	Influent	25.00	$25.00
2	1	Ammonia, NO2, NO3 ✓	Influent	25.00	$25.00
3	1	Orthophosphate ✓	Influent	15.00	$15.00
4	1	pH ✓	Influent	8.00	$8.00
5	1	TSS ✓	Influent	15.00	$15.00
6	1	Total Phosphorus ✓	Influent	15.00	$15.00
7	1	Conductivity ✓	Influent	8.00	$8.00
8	1	Total ICP Metals (Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Li, Na; Ni, Pb, Sb, Si, Sn, Sr, Tl, U, V, Zn)	Influent	50.00	$50.00
9	1	LC50 Bioassay (R Trout) (sub-contracted)	Influent	595.00	$595.00
10	1	Total and Fecal Coliforms	Influent	26.00	$26.00
11	1	Pick up from Ottawa Airport	-	25.00	$25.00
			Subtotal		807.00
			Env. Surch. $1.50/Sample		1.50
			HST		105.11
			Total Cost		$913.61

Prices do not include shipping unless otherwise stated.

Damien Gilbert
Director of Business Development
Caduceon Environmental Laboratories
dgilbert@caduceonlabs.com