

Appendix C

Certificates of Chemical Analysis for Water Samples Submitted to the Research and Productivity Council Laboratory



RPC
921 College Hill Rd,
Fredericton, N.B. E3B 6Z9
Report No.: 31733-IAS

Jacques Whitford Environment
PO Box 1116
Fredericton NB E3B 5C2
Attn: M. Stephenson
Job No.: 15058

August 15, 2003
Revised: October 14, 2003

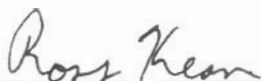
Fax: 506-452-7652

RECEIVED
OCT 14 2003

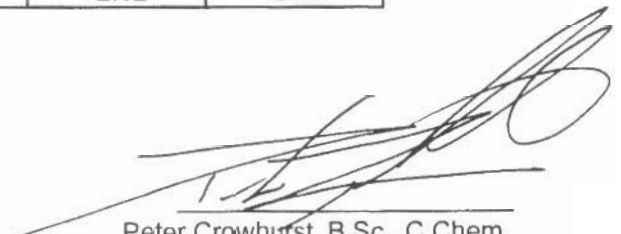
General Chemistry Analysis

	Concentration (mg/L)			
RPC ID	31733-03	31733-04	31733-05	31733-06
Client ID	T0-1	T0-2	T150-1	T150-2
Sodium	0.35	0.35	2.99	1.36
Potassium	0.18	0.18	2.54	1.06
Calcium	2.30	2.27	40.3	17.1
Magnesium	1.50	1.51	3.54	2.26
Iron	0.08	0.08	0.11	0.09
Manganese	0.001	0.001	0.025	0.010
Copper	< 0.001	< 0.001	0.002	< 0.001
Zinc	< 0.001	< 0.001	0.006	0.002
Ammonia (as N)	< 0.05	< 0.05	0.16	< 0.05
pH	6.7	6.8	6.9	6.8
Alkalinity (as CaCO ₃)	7	8	11	9
Chloride	< 0.5	< 0.5	25.9	10.1
Sulfate	5	4	74	33
Nitrate + Nitrite (as N)	< 0.05	< 0.05	0.27	0.10
o-Phosphate (as P)	< 0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO ₂)	0.6	0.6	0.5	0.5
Total Organic Carbon	< 0.5	< 0.5	0.7	< 0.5
Turbidity (NTU)	1.8	2.2	1.2	1.3
Conductivity (uS/cm)	28	28	276	133

Calculated Parameters				
Bicarbonate as CaCO ₃	7.0	8.0	11.0	9.0
Carbonate as CaCO ₃	0.003	0.005	0.009	0.006
Hydroxide as CaCO ₃	0.003	0.003	0.004	0.003
Cation sum (meq/L)	0.262	0.262	2.52	1.13
Anion sum (meq/L)	0.244	0.243	2.51	1.16
% difference	3.63	3.68	0.11	-1.23
Theoretical Conductivity	27.7	27.0	293	137
Hardness (as CaCO ₃)	11.9	11.9	115	52.0
Ion Sum (mg/L)	14.3	13.9	158	71.4
Saturation pH (5°C)	10.3	10.3	8.96	9.38
Langelier Index (5°C)	-3.59	-3.47	-2.02	-2.55



A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry



Peter Crowhurst, B.Sc., C.Chem.
Analytical Chemist
Inorganic Analytical Chemistry

General Chemistry Analysis

	Concentration (mg/L)			
RPC ID	31733-07	31733-08	31733-09	31733-10
Client ID	T400-1	T400-2	T600-1	T600-2
Sodium	1.34	1.20	1.30	1.33
Potassium	1.05	0.94	1.03	1.06
Calcium	16.5	14.7	16.2	16.4
Magnesium	2.27	2.20	2.33	2.44
Iron	0.09	0.09	0.08	0.09
Manganese	0.011	0.010	0.011	0.011
Copper	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	0.002	< 0.001	0.001	< 0.001
Ammonia (as N)	< 0.05	< 0.05	< 0.05	< 0.05
pH	6.9	7.0	7.0	7.0
Alkalinity (as CaCO ₃)	8	8	8	8
Chloride	8.9	7.8	8.2	8.1
Sulfate	33	30	32	36
Nitrate + Nitrite (as N)	0.10	0.09	0.10	0.10
o-Phosphate (as P)	< 0.01	< 0.01	< 0.01	< 0.01
r-Silica (as SiO ₂)	0.5	0.5	0.6	0.6
Total Organic Carbon	< 0.5	< 0.5	0.5	0.5
Turbidity (NTU)	1.2	1.2	1.2	1.4
Conductivity (uS/cm)	131	116	128	130

Calculated Parameters				
Bicarbonate as CaCO ₃	8.0	8.0	8.0	8.0
Carbonate as CaCO ₃	0.006	0.008	0.008	0.008
Hydroxide as CaCO ₃	0.004	0.005	0.005	0.005
Cation sum (meq/L)	1.10	0.996	1.09	1.11
Anion sum (meq/L)	1.11	1.01	1.06	1.15
% difference	-0.20	-0.74	1.08	-1.58
Theoretical Conductivity	132	120	129	135
Hardness (as CaCO ₃)	50.5	45.8	50.0	51.0
Ion Sum (mg/L)	69.0	62.7	67.1	71.4
Saturation pH (5°C)	9.44	9.49	9.45	9.45
Langelier Index (5°C)	-2.51	-2.49	-2.45	-2.43

Appendix D

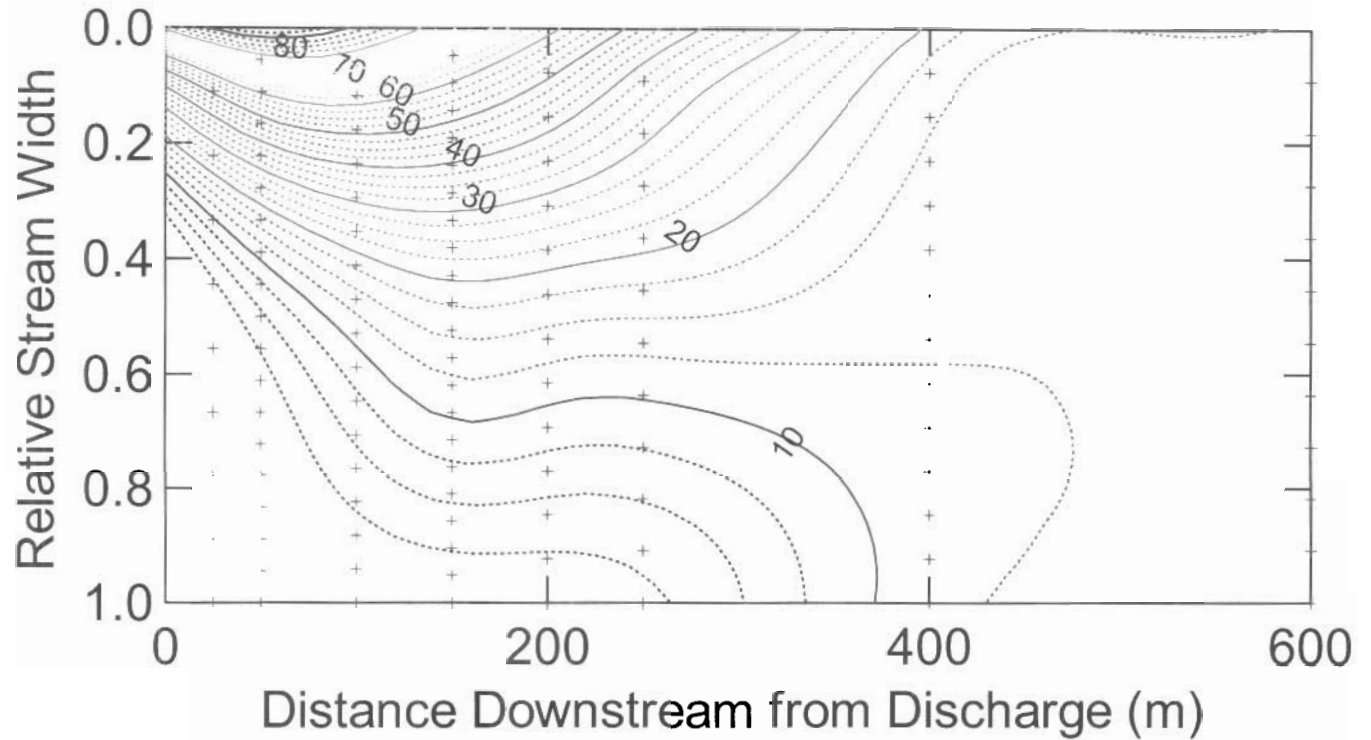
**Physical and Chemical Water Quality Data
Corrected During the Plume Delineation Study
July 11, 2003**



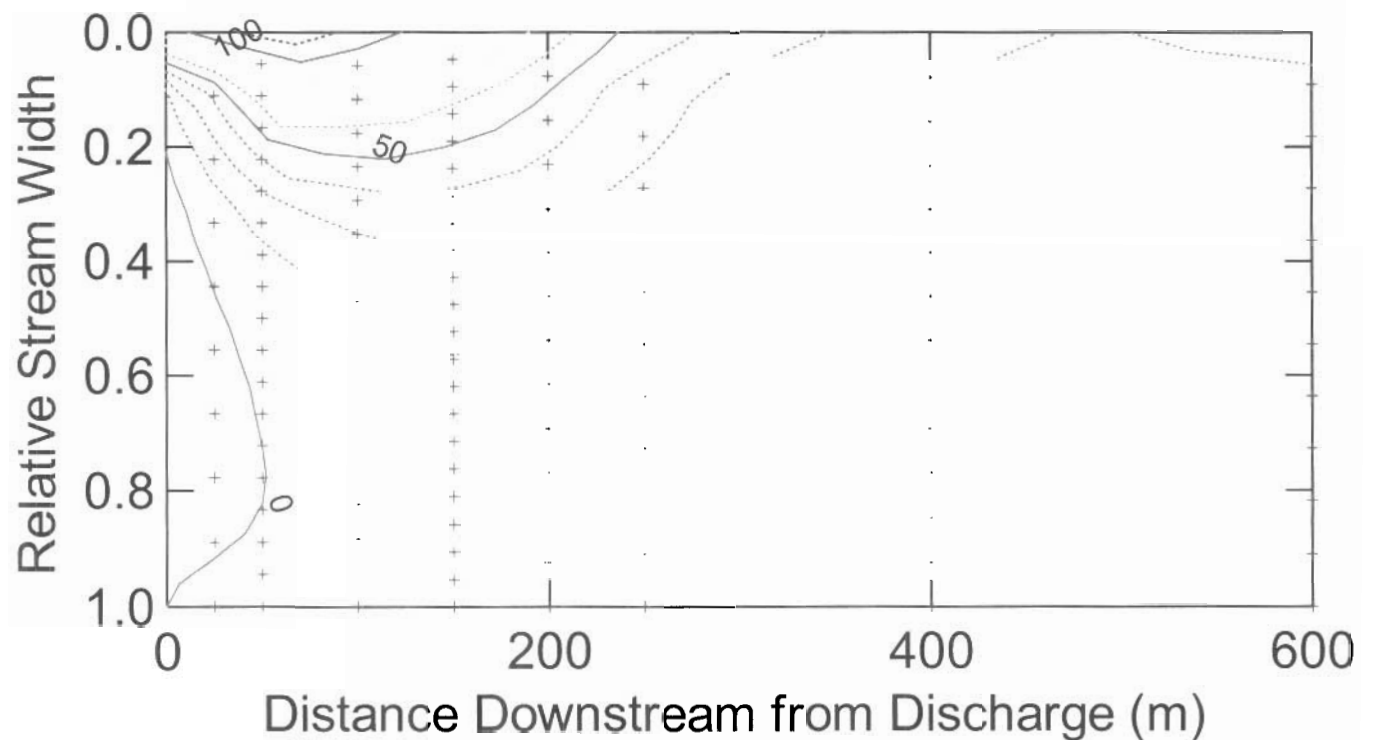
Effluent Conductivity = 740 uS/cm; background stream conductivity = 29 uS/cm.																
Distance Across Stream (m)	T0	% effluent	T50	% effluent	T100	% effluent	T150	% effluent	T200	% effluent	T250	% effluent	T400	% effluent	T600	% effluent
1.000	29.000	0.000	723.000	97.609	573.000	76.512	488.000	61.744	420.000	54.993	211.000	25.598	137.000	15.190	127.000	13.783
2.000	28.000	-0.141	694.000	93.530	509.000	67.511	450.000	59.212	354.000	45.710	208.000	25.176	133.000	14.627	127.000	13.783
3.000	28.000	-0.141	539.000	71.730	458.000	60.338	404.000	52.743	300.000	38.115	205.000	24.754	128.000	13.924	127.000	13.783
4.000	28.000	-0.141	350.000	45.148	363.000	46.976	357.000	46.132	210.000	25.457	197.000	23.629	125.000	13.502	127.000	13.783
5.000	28.000	-0.141	199.000	23.910	270.000	33.896	305.000	38.819	136.000	15.049	175.000	20.534	125.000	13.502	127.000	13.783
6.000	28.000	-0.141	145.000	16.315	205.000	24.754	282.000	35.584	87.000	8.158	147.000	16.596	125.000	13.502	127.000	13.783
7.000	28.000	-0.141	115.000	12.096	144.000	16.174	250.000	31.083	61.000	4.501	111.000	11.533	123.000	13.221	127.000	13.783
8.000	29.000	0.000	76.000	6.610	110.000	11.392	235.000	28.973	43.000	1.969	97.000	9.564	121.000	12.940	127.000	13.783
9.000	29.000	0.000	53.000	3.376	84.000	7.736	223.000	27.286	33.000	0.563	60.000	4.360	117.000	12.377	127.000	13.783
10.000	29.000	0.000	46.000	2.391	67.000	5.345	213.000	25.879	31.000	0.281	41.000	1.688	115.000	12.096	127.000	13.783
11.000	29.000	0.000	35.000	0.844	55.000	3.657	204.000	24.613	31.000	0.281	34.000	0.703	114.000	11.955	127.000	13.783
12.000	29.000	0.000	29.000	0.000	43.000	1.969	197.000	23.629	31.000	0.281			113.000	11.814	127.000	13.783
13.000	28.000	-0.141	28.000	-0.141	36.000	0.985	186.000	22.082	31.000	0.281			111.000	11.533		
14.000	28.000	-0.141	28.000	-0.141	32.000	0.422	174.000	20.394								
15.000	28.000	-0.141	28.000	-0.141	29.000	0.000	160.000	18.425								
16.000	28.000	-0.141	28.000	-0.141	29.000	0.000	135.000	14.909								
17.000	29.000	0.000	29.000	0.000	29.000	0.000	108.000	11.111								
18.000	29.000	0.000					83.000	7.595								
19.000							57.000	3.938								
20.000							42.000	1.828								
							33.000	0.563								

% effluent = ((measured*100)-2900)/(740-29)

Effluent Dilution Measured by Conductivity



Effluent Dilution Measured by Temperature



Appendix E

**Stream Flow Data, Twin Lakes Creek
July 11, 2003**



Downstream of Confluence								
Station	Depth	Area	V1	Flow1	V2	Flow2	Average Flow	
1	0.08	0.06	0.22	0.0132	0.22	0.0132	0.0132	
2	0.11	0.11	0.25	0.0275	0.24	0.0264	0.02695	
3	0.15	0.15	0.47	0.0705	0.47	0.0705	0.0705	
4	0.18	0.18	0.55	0.099	0.53	0.0954	0.0972	
5	0.19	0.19	0.42	0.0798	0.41	0.0779	0.07885	
6	0.25	0.25	0.38	0.095	0.39	0.0975	0.09625	
7	0.25	0.25	0.23	0.0575	0.21	0.0525	0.055	
8	0.26	0.26	0.2	0.052	0.22	0.0572	0.0546	
9	0.22	0.22	0.29	0.0638	0.3	0.066	0.0649	
10	0.24	0.24	0.59	0.1416	0.59	0.1416	0.1416	
11	0.225	0.225	0.33	0.07425	0.34	0.0765	0.075375	
12	0.21	0.21	0.33	0.0693	0.37	0.0777	0.0735	
13	0.18	0.18	0.51	0.0918	0.52	0.0936	0.0927	
14	0.14	0.14	0.26	0.0364	0.3	0.042	0.0392	
15	0.13	0.13	0.24	0.0312	0.25	0.0325	0.03185	
16	0.11	0.11	0.25	0.0275	0.24	0.0264	0.02695	
17	0.09	0.0675	0.17	0.011475	0.14	0.00945	0.0104625	
				1.041825		1.05635	1.0490875	

Upstream of Confluence								
Station	Depth	Area	V1	Flow1	V2	Flow2	Average Flow	
1	0.14	0.105	0.35	0.03675	0.34	0.0357	0.036225	
2	0.34	0.34	0.37	0.1258	0.37	0.1258	0.1258	
3	0.35	0.35	0.62	0.217	0.61	0.2135	0.21525	
4	0.38	0.38	0.63	0.2394	0.63	0.2394	0.2394	
5	0.34	0.34	0.48	0.1632	0.44	0.1496	0.1564	
6	0.22	0.22	0.37	0.0814	0.36	0.0792	0.0803	
7	0.2	0.2	0.47	0.094	0.46	0.092	0.093	
8	0.18	0.18	0.24	0.0432	0.23	0.0414	0.0423	
9	0.175	0.13125	0.21	0.0275625	0.21	0.0275625	0.0275625	
				1.0283125		1.0041625	1.0162375	

Shallow Weir 2.0 m wide								
Station	Depth	Area	V1	Flow1	V2	Flow2	Average Flow	
0.58	0.06	0.0498	1.25	0.06225	1.27	0.063246	0.062748	
1.08	0.05	0.024	1.1	0.0264	1.06	0.02544	0.02592	
1.54	0.04	0.0396	1.28	0.050688	1.27	0.050292	0.05049	
				0.139338		0.138978	0.139158	

Appendix F

Benthic Invertebrates Collected in Twin Lakes Creek July 11, 2003



Taxa	Samples														
	TLC1	TLC2	TLC3	TLC4	TLC5	WTL1	WTL2	WTL3	WTL4	WTL5	ETL1	ETL2	ETL3	ETL4	ETL5
Chironomidae	3	12	5	7	7							9	9	14	3
Tipulidae				2											
Other Diptera															
Cladocera	1			1											1

Notes:

TLC-2 was re-sorted for QA purposes and 1 additional chironomid was recovered (included in total above)

ETL-4 was re-sorted for QA purposes, but no additional benthos were recovered

Chironomids appear to be mainly Orthocladiinae

Cladocera were mainly large Daphnia, presumably drifting down from East Twin Lake (not true benthos).

No benthic invertebrates at all were found at WTL site. Possibly this area freezes completely in winter (no direct stream flow)?