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Nunalingni Kavamatkunnilu Pivikhaqautikkut
Department of Community and Government Services
Ministère des Services communautaires et gouvernementaux

October 10, 2014

Thomas Kabloona
Chairperson
Nunavut Water Board
P.O. Box 119, Gjoa Haven, Nunavut
X0B 1J0
Phone: (867) 360-6338
Fax: (867) 360-6369

Re: Water Licence No. 3AM-GRA1015 Water Chemistry Information

Dear Mr. Kabloona,

After receiving the letter with subject "Water Licence No. 3AM-GRA1015 "Hamlet of Rankin Inlet, Nunavut", Government of Nunavut Department of Community and Government Services; Requested Extension to Closing of the Hearing Record" and discussions with Damien Coté and Karén Kharatyan of the NWB on October 6, 2014, GN-CGS agreed to immediately sample Lower Landing Lake and Char River for general water chemistry, and Lower Landing Lake, Char River and Nipissar Lake for hydrocarbon contamination. These samples were sent to ALS Environmental in Winnipeg and a *draft* Certificate of Analysis was received by GN-CGS October 9, 2014. These preliminary results, along with water chemistry analysis that was done for Nipissar Lake and Char River on June 25, 2014 are enclosed with this letter. A final Certificate of Analysis and comparative summary of water chemistry will be submitted by GN-CGS to the NWB by October 6 2014. Emphasis is placed on the fact that the October 9, 2014 Certificate of Analysis is a *draft*, and therefore does not include results for all analyses requested.

The "Summary of Water Chemistry Analysis" (enclosed) confirms that all parameters analyzed for Nipissar Lake, Char River and Lower Landing Lake are within the maximum acceptable concentrations, as well as aesthetic objectives and operational guidance values, of the Guidelines for Canadian Drinking Water Quality. GN-CGS suggests that the water chemistry of these three sources continues to be monitored on an annual basis.

The "Summary of Hydrocarbon Contamination Analysis" (enclosed) confirms there is no indication of hydrocarbon presence in either Char River or Lower Landing Lake. BTEX, Total Hydrocarbon, and Polyaromatic Hydrocarbon results all came back as being under the detection limit, and within Guidelines for Canadian Drinking Water Quality. Because of community concern raised over the possible presence of hydrocarbons in Lower Landing Lake during the TM/PHC and the Public Hearing, it is suggested that sampling be done once annually to continue to confirm these results.

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Nunalingni Kavamatkunnilu Pivikhaqautikkut
Department of Community and Government Services
Ministère des Services communautaires et gouvernementaux

GN-CGS proposes that a requirement be added to Part J: Conditions applying to the Monitoring Program of the Water Licence for annual sampling during spring freshet of Nipissar Lake, Char River, and Lower Landing Lake as below:

Monitoring Program Station Number	Description	Frequency	Status
GRA-5	Raw water from Nipissar Lake	Annually (spring freshet)	Active (quality)
GRA-6	Raw water from Char River	Annually (spring freshet)	Active (quality)
GRA-7	Raw water from Lower Landing Lake	Annually (spring freshet)	Active (quality)

The final Certificate of Analysis for the October 7, 2014 sampling will be provided by GN-CGS to the NWB by **October 16, 2014**, along with an updated "Summary of Water Chemistry Analysis" and "Summary of Hydrocarbon Contamination Analysis". In the meantime, please contact the undersigned if there are any questions and/or concerns regarding the provided water chemistry information.

Sincerely,

Megan Lusty, EIT
Municipal Planning Engineer-In-Training
Community and Government Services
Kivalliq Region, Government of Nunavut
P.O. Box 490, Rankin Inlet, NU, X0C 0G0
Phone: (867) 645-8176
Fax: (867) 645-8196
Email: mlusty@gov.nu.ca

Enclosures:
Summary of Water Chemistry Analysis (2 pages)
Summary of Hydrocarbon Contamination Analysis (2 pages)
Certificate of Analysis, June 25, 2014 (7 pages)
Draft Certificate of Analysis, October 7, 2014 (10 pages)
Guidelines for Canadian Drinking Water Quality Summary Table, August 2012 (22 pages)

Summary of Water Chemistry Analysis

Parameters	Units	Detection Limit	24-Jun-14		07-Oct-14		Guidelines for Canadian Drinking Water Quality
			Nipissar Lake	Char River	Char River	Lower Landing Lake	
Miscellaneous Parameters							
Ammonia, Total (as N)	mg/L	0.010	<0.010	<0.010	<0.010	0.037	None required
Phosphorus (P)-Total	mg/L	0.010	0.02	0.013	<0.010	<0.010	
Total Kjeldahl Nitrogen	mg/L	0.20			0.27	0.27	
Fecal Coliforms	MPN/100mL	3	<3	<3			
Total Suspended Solids	mg/L	5	8	<5.0			
Alkalinity							
Alkalinity, Total (as CaCO3)	mg/L	20	41	20	25	23	
Bicarbonate (HCO3)	mg/L	24	50	25	30	28	
Carbonate (CO3)	mg/L	12	<12	<12	<12	<12	
Hydroxide (OH)	mg/L	6.8	<6.8	<6.8	<6.8	<6.8	
Chloride by Ion Chromatography							
Chloride	mg/L	0.50	30.5	15.7	22.4	24.2	AO: ≤ 250 mg/L
Conductivity							
Conductivity	umhos/cm	20	210	104	150	151	
Hardness Calculated							
Hardness (as CaCO3)	mg/L	0.30	54.9	24.3	35.7	32.1	None required
Nitrate as N by Ion Chromatography							
Nitrate-N	mg/L	0.05	<0.050	<0.050	<0.050	<0.050	
Nitrate+Nitrite							
Nitrate and Nitrite as N	mg/L	0.071	<0.071	<0.071	<0.071	<0.071	10 mg/L as nitrate-nitrogen
Nitrite as N by Ion Chromatography							
Nitrite-N	mg/L	0.050	<0.050	<0.050	<0.050	<0.050	
Sulfate by Ion Chromatography							
Sulfate	mg/L	0.50	11	4.75	8.99	7.89	AO: ≤ 500 mg/L
TDS Calculated							
TDS (Calculated)	mg/L	5.0	105	50.3	73.8	73.8	AO: < 500 mg/L
Total Metals by ICP-MS							
Aluminum (Al)-Total	mg/L	0.02	0.075	<.010	<0.020	0.020	OG: <0.1 mg/L (conventional); <0.2 mg/L (other treatment types)
Antimony (Sb)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	MAC: 0.006 mg/L
Arsenic (As)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	MAC: 0.010 mg/L
Barium (Ba)-Total	mg/L	0.0005	0.01444	0.0102	0.0149	0.0134	MAC: 1.0 mg/L
Beryllium (Be)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	
Bismuth (Bi)-Total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	
Boron (B)-Total	mg/L	0.03	0.037	<0.030	<0.030	<0.030	MAC: 5 mg/L
Cadmuim (Cd)-Total	mg/L	0.0002	<0.00020	<0.00020	<0.00020	<0.00020	MAC: 0.005 mg/L
Calcium (Ca)-Total	mg/L	0.2	16.6	7.3	10.2	8.62	None required
Cesium (Cs)- Total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	
Chromium (Cr)-Total	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	MAC: 0.05 mg/L
Cobalt (Co)-Total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	
Copper (Cu)-Total	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	AO: ≤ 1.0 mg/L
Iron (Fe)-Total	mg/L	0.1	<0.10	<0.10	<0.0.	<0.10	AO: ≤ 0.3 mg/L
Lead (Pb)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	MAC: 0.010 mg/L
Lithium (Li)-Total	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	
Magnesium (Mg)-Total	mg/L	0.05	3.24	1.47	2.49	2.58	None required

Manganese (Mn)-Total	mg/L	0.001	0.006	0.0043	0.0054	0.0039	AO: ≤ 0.05 mg/L
Molybdenum (Mo)-Total	mg/L	0.0005	0.00067	<0.00050	<0.00050	0.00055	
Nickel (Ni)- Total	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	
Phosphorus (P)-Total	mg/L	0.5	<0.50	<0.50	<0.50	<0.50	
Potassium (K)-Total	mg/L	0.1	1.86	1.03	1.60	1.59	
Rubidium (Rb)-Total	mg/L	0.0005	0.00164	0.00144	0.00203	0.00195	
Selenium (Se)-Total	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	MAC: 0.01 mg/L
Silicon (Si)-Total	mg/L	0.3	<0.30	<0.30	<0.30	<0.30	
Silver(Ag)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	None required
Sodium(Na)-Total	mg/L	0.05	16.6	7.98	13.4	15.2	AO: ≤ 200 mg/L
Strontium(Sr)-Total	mg/L	0.0005	0.0826	0.0426	0.0547	0.0514	
Tellurium(Te)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	
Thallium(Tl)-Total	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	
Thorium(Th)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	
Tin(Sn)-Total	mg/L	0.0006	<0.00060	<0.00060	<0.00060	<0.00060	
Titanium(Ti)-Total	mg/L	0.001	0.0029	<0.0010	<0.0010	<0.0010	
Tungsten(W)-Total	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	
Uranium(U)-Total	mg/L	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	MAC: 0.02 mg/L
Vanadium(V)-Total	mg/L	0.002	<0.0020	<0.0020	<0.0020	<0.0020	
Zinc(Zn)-Total	mg/L	0.02	<0.020	<0.020	<0.020	<0.020	AO: ≤ 5.0 mg/L
Zirconium(Zr)-Total	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	
pH							
pH	pH Units	0.1	7.77	7.46	7.63	7.62	6.5-8.5

MAC - Maximum acceptable concentrations (health based)
AO - Aesthetic objectives (based on aesthetic considerations)
OG - Operational guidance values (based on operational considerations)

Summary of Hydrocarbon Contamination Analysis

Parameters	Units	Detection Limit	07-Oct-14			Guidelines for Canadian Drinking Water Quality
			Nipissar Lake	Char River	Lower Landing Lake	
BTX plus F1 by GCMS						
Benzene	mg/L	0.00050	<0.00050	<0.00050	<0.00050	MAC: 0.005 mg/L
Toluene	mg/L	0.0010	<0.0010	<0.0010	<0.0010	AO: ≤ 0.024 mg/L [1]
Ethylbenzene	mg/L	0.00050	<0.00050	<0.00050	<0.00050	AO: ≤ 0.0024 mg/L [2]
o-Xylene	mg/L	0.00050	<0.00050	<0.00050	<0.00050	
m+p-Xylenes	mg/L	0.00050	<0.00050	<0.00050	<0.00050	
F1 (C6-C10)	mg/L	0.10	<0.10	<0.10	<0.10	
CCME Total Hydrocarbons						
F1-BTEX	mg/L	0.10	<0.10	<0.10	<0.10	
F2-Naphth	mg/L	0.25	<0.25	<0.25	<0.25	
F3-PAH	mg/L	0.25	<.025	<.025	<.025	
Total Hydrocarbons (C6-C50)	mg/L	0.44	<0.44	<0.44	<0.44	
F2-F4 PHC Method						
F2 (C10-C16)	mg/L	0.25	<0.25	<0.25	<0.25	
F3 (C16-C34)	mg/L	0.25	<0.25	<0.25	<0.25	
F4 (C34-C50)	mg/L	0.25	<0.25	<0.25	<0.25	
Sum of Xylene Isomer Concentrations						
Xylenes (Total)	mg/L	0.0015	<0.0015	<0.0015	<0.0015	AO: ≤ 0.3 mg/L [3]
Polyaromatic Hydrocarbons (PAHs)						
1-Methyl Napthalene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
2-Methyl Naphthalene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Acenaphthene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Acenaphthylene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Anthracene	mg/L	0.000010	<0.000010	<0.000010	<0.000010	
Acridine	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Benzo(a)anthracene	mg/L	0.000010	<0.000010	<0.000010	<0.000010	
Benzo(a)pyrene	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	MAC: 0.00001 mg/L
Benzo(b&j)fluoranthene	mg/L	0.000010	<0.000010	<0.000010	<0.000010	
Benzo(g,h,i)perylene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Benzo(k)fluoranthene	mg/L	0.000010	<0.000010	<0.000010	<0.000010	
Chrysene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Dibenzo(a,h)anthracene	mg/L	0.0000050	<0.0000050	<0.0000050	<0.0000050	

Fluoranthene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Fluorene	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
Indeno(1,2,3-cd)pyrene	mg/L	0.000010	<0.000010	<0.000010	<0.000010	
Naphthalene	mg/L	0.000050	0.000061	<0.000050	<0.000050	
Phenanthrene	mg/L	0.000050	<0.000050	<0.000050	<0.000050	
Pyrene	mg/L	0.000010	<0.000010	<0.000010	<0.000010	
Quinoline	mg/L	0.000020	<0.000020	<0.000020	<0.000020	
B(a)P Total Potency Equivalent	mg/L	0.000030	<0.000030	<0.000030	<0.000030	

MAC - Maximum acceptable concentrations (health based)
AO - Aesthetic objectives (based on aesthetic considerations)
OG - Operational guidance values (based on operational considerations)

[1] AO based on odour

[3] AO based on odour; levels above the AO would render drinking water unpalatable

[3] AO based on taste and odour; levels above the AO would render water unpalatable

Nunavut - Community & Government Services
- Rankin Inlet
ATTN: MEGAN LUSTY
PO BOX 490
BAG 002
Rankin Inlet NU X0C 0G0

Date Received: 25-JUN-14
Report Date: 04-JUL-14 09:28 (MT)
Version: FINAL

Client Phone: 867-645-8176

Certificate of Analysis

Lab Work Order #: L1476895

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:

Barb Bayer
General Manager, Winnipeg

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1476895-1 NIPISSOR LAKE							
Sampled By: MEGAN LUSTY on 24-JUN-14 @ 10:45							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.010		0.010	mg/L		30-JUN-14	R2876966
Fecal Coliforms	<3		3	MPN/100mL		02-JUL-14	R2878375
Phosphorus (P)-Total	0.020		0.010	mg/L		02-JUL-14	R2877002
Total Suspended Solids	8.0		5.0	mg/L		27-JUN-14	R2875948
Routine Soluble + Metal scan							
Alkalinity							
Alkalinity, Total (as CaCO3)	41		20	mg/L		30-JUN-14	R2876471
Bicarbonate (HCO3)	50		24	mg/L		30-JUN-14	R2876471
Carbonate (CO3)	<12		12	mg/L		30-JUN-14	R2876471
Hydroxide (OH)	<6.8		6.8	mg/L		30-JUN-14	R2876471
Chloride by Ion Chromatography							
Chloride	30.5		0.50	mg/L		26-JUN-14	R2875938
Conductivity							
Conductivity	210		20	umhos/cm		30-JUN-14	R2876471
Hardness Calculated							
Hardness (as CaCO3)	54.9		0.30	mg/L		02-JUL-14	
Nitrate as N by Ion Chromatography							
Nitrate-N	<0.050		0.050	mg/L		26-JUN-14	R2875938
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.071		0.071	mg/L		30-JUN-14	
Nitrite as N by Ion Chromatography							
Nitrite-N	<0.050		0.050	mg/L		26-JUN-14	R2875938
Sulfate by Ion Chromatography							
Sulfate	11.0		0.50	mg/L		26-JUN-14	R2875938
TDS calculated							
TDS (Calculated)	105		5.0	mg/L		02-JUL-14	
Total Metals by ICP-MS							
Aluminum (Al)-Total	0.075		0.020	mg/L	30-JUN-14	30-JUN-14	R2876428
Antimony (Sb)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Arsenic (As)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Barium (Ba)-Total	0.0144		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Beryllium (Be)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Boron (B)-Total	0.037		0.030	mg/L	30-JUN-14	30-JUN-14	R2876428
Cadmium (Cd)-Total	<0.00020		0.00020	mg/L	30-JUN-14	30-JUN-14	R2876428
Calcium (Ca)-Total	16.6		0.20	mg/L	30-JUN-14	30-JUN-14	R2876428
Cesium (Cs)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Chromium (Cr)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Cobalt (Co)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Copper (Cu)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Iron (Fe)-Total	<0.10		0.10	mg/L	30-JUN-14	30-JUN-14	R2876428
Lead (Pb)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Lithium (Li)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Magnesium (Mg)-Total	3.24		0.050	mg/L	30-JUN-14	30-JUN-14	R2876428
Manganese (Mn)-Total	0.0060		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Molybdenum (Mo)-Total	0.00067		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Nickel (Ni)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Phosphorus (P)-Total	<0.50		0.50	mg/L	30-JUN-14	30-JUN-14	R2876428
Potassium (K)-Total	1.86		0.10	mg/L	30-JUN-14	30-JUN-14	R2876428
Rubidium (Rb)-Total	0.00164		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Selenium (Se)-Total	<0.0050		0.0050	mg/L	30-JUN-14	30-JUN-14	R2876428
Silicon (Si)-Total	<0.30		0.30	mg/L	30-JUN-14	30-JUN-14	R2876428

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1476895-1 NIPISSOR LAKE							
Sampled By: MEGAN LUSTY on 24-JUN-14 @ 10:45							
Matrix: WATER							
Total Metals by ICP-MS							
Silver (Ag)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Sodium (Na)-Total	16.6		0.050	mg/L	30-JUN-14	30-JUN-14	R2876428
Strontium (Sr)-Total	0.0826		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Tellurium (Te)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Thallium (Tl)-Total	<0.0050		0.0050	mg/L	30-JUN-14	30-JUN-14	R2876428
Thorium (Th)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Tin (Sn)-Total	<0.00060		0.00060	mg/L	30-JUN-14	30-JUN-14	R2876428
Titanium (Ti)-Total	0.0029		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Tungsten (W)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Uranium (U)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Vanadium (V)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Zinc (Zn)-Total	<0.020		0.020	mg/L	30-JUN-14	30-JUN-14	R2876428
Zirconium (Zr)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
pH							
pH	7.77		0.10	pH units		30-JUN-14	R2876471
L1476895-2 CHAR RIVER							
Sampled By: MEGAN LUSTY on 24-JUN-14 @ 10:15							
Matrix: WATER							
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.010		0.010	mg/L		30-JUN-14	R2876966
Fecal Coliforms	<3		3	MPN/100mL		02-JUL-14	R2878375
Phosphorus (P)-Total	0.013		0.010	mg/L		02-JUL-14	R2877002
Total Suspended Solids	<5.0		5.0	mg/L		27-JUN-14	R2875948
Routine Soluble + Metal scan							
Alkalinity							
Alkalinity, Total (as CaCO3)	20		20	mg/L		30-JUN-14	R2876471
Bicarbonate (HCO3)	25		24	mg/L		30-JUN-14	R2876471
Carbonate (CO3)	<12		12	mg/L		30-JUN-14	R2876471
Hydroxide (OH)	<6.8		6.8	mg/L		30-JUN-14	R2876471
Chloride by Ion Chromatography							
Chloride	15.7		0.50	mg/L		26-JUN-14	R2875938
Conductivity							
Conductivity	104		20	umhos/cm		30-JUN-14	R2876471
Hardness Calculated							
Hardness (as CaCO3)	24.3		0.30	mg/L		02-JUL-14	
Nitrate as N by Ion Chromatography							
Nitrate-N	<0.050		0.050	mg/L		26-JUN-14	R2875938
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.071		0.071	mg/L		30-JUN-14	
Nitrite as N by Ion Chromatography							
Nitrite-N	<0.050		0.050	mg/L		26-JUN-14	R2875938
Sulfate by Ion Chromatography							
Sulfate	4.75		0.50	mg/L		26-JUN-14	R2875938
TDS calculated							
TDS (Calculated)	50.3		5.0	mg/L		02-JUL-14	
Total Metals by ICP-MS							
Aluminum (Al)-Total	<0.020		0.020	mg/L	30-JUN-14	30-JUN-14	R2876428
Antimony (Sb)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Arsenic (As)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Barium (Ba)-Total	0.0102		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Beryllium (Be)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1476895-2 CHAR RIVER							
Sampled By: MEGAN LUSTY on 24-JUN-14 @ 10:15							
Matrix: WATER							
Total Metals by ICP-MS							
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Boron (B)-Total	<0.030		0.030	mg/L	30-JUN-14	30-JUN-14	R2876428
Cadmium (Cd)-Total	<0.00020		0.00020	mg/L	30-JUN-14	30-JUN-14	R2876428
Calcium (Ca)-Total	7.30		0.20	mg/L	30-JUN-14	30-JUN-14	R2876428
Cesium (Cs)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Chromium (Cr)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Cobalt (Co)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Copper (Cu)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Iron (Fe)-Total	<0.10		0.10	mg/L	30-JUN-14	30-JUN-14	R2876428
Lead (Pb)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Lithium (Li)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Magnesium (Mg)-Total	1.47		0.050	mg/L	30-JUN-14	30-JUN-14	R2876428
Manganese (Mn)-Total	0.0043		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Molybdenum (Mo)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Nickel (Ni)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Phosphorus (P)-Total	<0.50		0.50	mg/L	30-JUN-14	30-JUN-14	R2876428
Potassium (K)-Total	1.03		0.10	mg/L	30-JUN-14	30-JUN-14	R2876428
Rubidium (Rb)-Total	0.00144		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Selenium (Se)-Total	<0.0050		0.0050	mg/L	30-JUN-14	30-JUN-14	R2876428
Silicon (Si)-Total	<0.30		0.30	mg/L	30-JUN-14	30-JUN-14	R2876428
Silver (Ag)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Sodium (Na)-Total	7.98		0.050	mg/L	30-JUN-14	30-JUN-14	R2876428
Strontium (Sr)-Total	0.0426		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Tellurium (Te)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Thallium (Tl)-Total	<0.0050		0.0050	mg/L	30-JUN-14	30-JUN-14	R2876428
Thorium (Th)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Tin (Sn)-Total	<0.00060		0.00060	mg/L	30-JUN-14	30-JUN-14	R2876428
Titanium (Ti)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
Tungsten (W)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Uranium (U)-Total	<0.00050		0.00050	mg/L	30-JUN-14	30-JUN-14	R2876428
Vanadium (V)-Total	<0.0020		0.0020	mg/L	30-JUN-14	30-JUN-14	R2876428
Zinc (Zn)-Total	<0.020		0.020	mg/L	30-JUN-14	30-JUN-14	R2876428
Zirconium (Zr)-Total	<0.0010		0.0010	mg/L	30-JUN-14	30-JUN-14	R2876428
pH							
pH	7.46		0.10	pH units		30-JUN-14	R2876471

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

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-WP	Water	Alkalinity	APHA 2320B
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.			
CL-IC-WP	Water	Chloride by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
EC-WP	Water	Conductivity	APHA 2510B
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.			
ETL-HARDNESS-TOT-WP	Water	Hardness Calculated	HARDNESS CALCULATED
ETL-SOLIDS-CALC-WP	Water	TDS calculated	CALCULATION
FC-MPN-WP	Water	Fecal Coliform	APHA 9221E
The Most Probable Number (MPN) method is based on the Multiple Tube Fermentation technique. The results of examination of replicate tubes and dilutions of a sample are reported after confirmations specific to total coliform, fecal coliform and E. coli are performed. Results are reported in MPN/100 mL for water and MPN/gram for food and solid samples.			
IONBALANCE-CALC-WP	Water	Ion Balance Calculation	APHA 1030E
MET-T-MS-WP	Water	Total Metals by ICP-MS	APHA 3030E/EPA 6020A-T
This analysis involves preliminary sample treatment by hotblock acid digestion (APHA 3030E). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			
NH3-COL-WP	Water	Ammonia by colour	APHA 4500 NH3 F
Ammonia in water samples forms indophenol when reacted with hypochlorite and phenol. The intensity is amplified by the addition of sodium nitroprusside and measured colourmetrically.			
NO2+NO3-CALC-WP	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-WP	Water	Nitrite as N by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
NO3-IC-WP	Water	Nitrate as N by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
P-T-COL-WP	Water	Phosphorus, Total	APHA 4500 P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-WP	Water	pH	APHA 4500H
The 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-IC-WP	Water	Sulfate by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
SOLIDS-TOTSUS-WP	Water	Total Suspended Solids	APHA 2540 D (modified)
Total suspended solids in aquesous matrices is determined gravimetrically after drying the residue at 103 105°C.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

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
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting 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.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

L1476895-COFC

10-026474

Page 1 of 1

Report To		Service Requested: (Rush subject to availability)
Company: GN-CGS	Standard: ✓ Other (specify):	✓ Regular (Standard Turnaround Times))
Contact: Megan Lusty	Select: PDF ✓ Excel ✓ Digital Fax	Priority, Date Req'd: _____ (Surcharges apply)
Address: P.O. Box 490, Rankin Inlet, NU X0C 0G0	Email 1: mlusty@gov.nu.ca	Emergency (1 Business Day) - 100% Surcharge
	Email 2:	For Emergency < 1 Day, ASAP or Weekend - Contact ALS
Phone: Fax:		

Invoice To	Client / Project Information
Same as Report ? (circle) Yes or No (if No, provide details)	
Copy of Invoice with Report? (circle) Yes or No	Job #:
Company:	PO / AFE:
Contact:	LSD:
Address:	
Phone: Fax:	Quote #:

Lab Work Order # (lab use only)	ALS Contact:	Sampler: Megan Lusty

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Routine	Nutrients	Fecal Coliforms	BOD	TSS	Number of Containers
1	Nipissor Lake	24-06-14	10:15 AM	Water	✓	✓	✓	✓	✓	4
2	Char River	24-06-14	10:15 AM	Water	✓	✓	✓	✓	✓	4

Analysis Request (Indicate Filtered or Preserved, F/P)

Special Instructions / Regulations / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Megan Lusty	June 24/14	11:00 AM	LD	June 25/14	2:40	17.5°C				

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION | WHITE - LABORATORY COPY | YELLOW - CLIENT COPY | GENF 18.01 Front

Nunavut - Community & Government Services
- Rankin Inlet
ATTN: MEGAN LUSTY
BAG 002
BOX 490
Rankin Inlet NU X0C 0G0

Date Received: 07-OCT-14
Report Date: 09-OCT-14 16:05 (MT)
Version: DRAFT

Client Phone: 867-645-8176

Certificate of Analysis

Lab Work Order #: L1529266

Project P.O. #: NOT SUBMITTED
Job Reference: 3AM - GRA1015
C of C Numbers:
Legal Site Desc:

Shannon Rapke-Gobeil
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1529266-1 LOWER LANDING LAKE							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 09:50							
Matrix: WATER							
BTEX plus F1-F4							
BTX plus F1 by GCMS							
Benzene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
Toluene	<0.0010		0.0010	mg/L		08-OCT-14	R2976408
Ethyl benzene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
o-Xylene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
m+p-Xylenes	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
F1 (C6-C10)	<0.10		0.10	mg/L		08-OCT-14	R2976408
Surrogate: 4-Bromofluorobenzene (SS)	100.7		70-130	%		08-OCT-14	R2976408
CCME Total Hydrocarbons							
F1-BTEX	<0.10		0.10	mg/L		09-OCT-14	
F2-Naphth	<0.25		0.25	mg/L		09-OCT-14	
F3-PAH	<0.25		0.25	mg/L		09-OCT-14	
Total Hydrocarbons (C6-C50)	<0.44		0.44	mg/L		09-OCT-14	
F2-F4 PHC method							
F2 (C10-C16)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
F3 (C16-C34)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
F4 (C34-C50)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
Surrogate: 2-Bromobenzotrifluoride	113.8		60-140	%	08-OCT-14	08-OCT-14	R2978314
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.0015		0.0015	mg/L		09-OCT-14	
Miscellaneous Parameters							
Ammonia, Total (as N)	0.037		0.010	mg/L		09-OCT-14	R2978517
Phosphorus (P)-Total	<0.010		0.010	mg/L		09-OCT-14	R2978911
Total Kjeldahl Nitrogen	0.27		0.20	mg/L	08-OCT-14	09-OCT-14	R2979096
Polyaromatic Hydrocarbons (PAHs)							
1-Methyl Naphthalene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
2-Methyl Naphthalene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Acenaphthene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Acenaphthylene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Anthracene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Acridine	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(a)anthracene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(a)pyrene	<0.0000050		0.0000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(b&j)fluoranthene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(g,h,i)perylene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(k)fluoranthene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Chrysene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Dibenzo(a,h)anthracene	<0.0000050		0.0000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Fluoranthene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Fluorene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Indeno(1,2,3-cd)pyrene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Naphthalene	<0.000050		0.000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Phenanthrene	<0.000050		0.000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Pyrene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Quinoline	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
B(a)P Total Potency Equivalent	<0.000030		0.000030	mg/L	08-OCT-14	09-OCT-14	R2978719
Surrogate: Acenaphthene d10	90.5		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Acridine d9	93.9		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Chrysene d12	77.9		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Naphthalene d8	90.0		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Phenanthrene d10	89.8		40-130	%	08-OCT-14	09-OCT-14	R2978719
Routine Soluble + Metal scan							

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1529266-1 LOWER LANDING LAKE							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 09:50							
Matrix: WATER							
Alkalinity							
Alkalinity, Total (as CaCO3)	23		20	mg/L		08-OCT-14	R2978494
Bicarbonate (HCO3)	28		24	mg/L		08-OCT-14	R2978494
Carbonate (CO3)	<12		12	mg/L		08-OCT-14	R2978494
Hydroxide (OH)	<6.8		6.8	mg/L		08-OCT-14	R2978494
Chloride by Ion Chromatography							
Chloride	24.2		0.50	mg/L		08-OCT-14	R2978909
Conductivity							
Conductivity	151		20	umhos/cm		08-OCT-14	R2978494
Hardness Calculated							
Hardness (as CaCO3)	32.1		0.30	mg/L		09-OCT-14	
Nitrate as N by Ion Chromatography							
Nitrate-N	<0.050		0.050	mg/L		08-OCT-14	R2978909
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.071		0.071	mg/L		09-OCT-14	
Nitrite as N by Ion Chromatography							
Nitrite-N	<0.050		0.050	mg/L		08-OCT-14	R2978909
Sulfate by Ion Chromatography							
Sulfate	7.89		0.50	mg/L		08-OCT-14	R2978909
TDS calculated							
TDS (Calculated)	73.8		5.0	mg/L		09-OCT-14	
Total Metals by ICP-MS							
Aluminum (Al)-Total	0.020		0.020	mg/L	08-OCT-14	08-OCT-14	R2978241
Antimony (Sb)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Arsenic (As)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Barium (Ba)-Total	0.0134		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Beryllium (Be)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Boron (B)-Total	<0.030		0.030	mg/L	08-OCT-14	08-OCT-14	R2978241
Cadmium (Cd)-Total	<0.00020		0.00020	mg/L	08-OCT-14	08-OCT-14	R2978241
Calcium (Ca)-Total	8.62		0.20	mg/L	08-OCT-14	08-OCT-14	R2978241
Cesium (Cs)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Chromium (Cr)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Cobalt (Co)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Copper (Cu)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Iron (Fe)-Total	<0.10		0.10	mg/L	08-OCT-14	08-OCT-14	R2978241
Lead (Pb)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Lithium (Li)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Magnesium (Mg)-Total	2.58		0.050	mg/L	08-OCT-14	08-OCT-14	R2978241
Manganese (Mn)-Total	0.0039		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Molybdenum (Mo)-Total	0.00055		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Nickel (Ni)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Phosphorus (P)-Total	<0.50		0.50	mg/L	08-OCT-14	08-OCT-14	R2978241
Potassium (K)-Total	1.59		0.10	mg/L	08-OCT-14	08-OCT-14	R2978241
Rubidium (Rb)-Total	0.00195		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Selenium (Se)-Total	<0.0050		0.0050	mg/L	08-OCT-14	08-OCT-14	R2978241
Silicon (Si)-Total	<0.30		0.30	mg/L	08-OCT-14	08-OCT-14	R2978241
Silver (Ag)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Sodium (Na)-Total	15.2		0.050	mg/L	08-OCT-14	08-OCT-14	R2978241
Strontium (Sr)-Total	0.0514		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Tellurium (Te)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Thallium (Tl)-Total	<0.0050		0.0050	mg/L	08-OCT-14	08-OCT-14	R2978241
Thorium (Th)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1529266-1 LOWER LANDING LAKE							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 09:50							
Matrix: WATER							
Total Metals by ICP-MS							
Tin (Sn)-Total	<0.00060		0.00060	mg/L	08-OCT-14	08-OCT-14	R2978241
Titanium (Ti)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Tungsten (W)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Uranium (U)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Vanadium (V)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Zinc (Zn)-Total	<0.020		0.020	mg/L	08-OCT-14	08-OCT-14	R2978241
Zirconium (Zr)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
pH							
pH	7.62		0.10	pH units		08-OCT-14	R2978494
L1529266-2 NIPISSAR LAKE							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 10:25							
Matrix: WATER							
BTEX plus F1-F4							
BTX plus F1 by GCMS							
Benzene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
Toluene	<0.0010		0.0010	mg/L		08-OCT-14	R2976408
Ethyl benzene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
o-Xylene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
m+p-Xylenes	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
F1 (C6-C10)	<0.10		0.10	mg/L		08-OCT-14	R2976408
Surrogate: 4-Bromofluorobenzene (SS)	102.3		70-130	%		08-OCT-14	R2976408
CCME Total Hydrocarbons							
F1-BTEX	<0.10		0.10	mg/L		09-OCT-14	
F2-Naphth	<0.25		0.25	mg/L		09-OCT-14	
F3-PAH	<0.25		0.25	mg/L		09-OCT-14	
Total Hydrocarbons (C6-C50)	<0.44		0.44	mg/L		09-OCT-14	
F2-F4 PHC method							
F2 (C10-C16)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
F3 (C16-C34)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
F4 (C34-C50)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
Surrogate: 2-Bromobenzotrifluoride	93.4		60-140	%	08-OCT-14	08-OCT-14	R2978314
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.0015		0.0015	mg/L		09-OCT-14	
Polyaromatic Hydrocarbons (PAHs)							
1-Methyl Naphthalene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
2-Methyl Naphthalene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Acenaphthene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Acenaphthylene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Anthracene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Acridine	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(a)anthracene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(a)pyrene	<0.0000050		0.0000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(b&j)fluoranthene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(g,h,i)perylene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(k)fluoranthene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Chrysene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Dibenzo(a,h)anthracene	<0.0000050		0.0000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Fluoranthene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Fluorene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Indeno(1,2,3-cd)pyrene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1529266-2 NIPISSAR LAKE							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 10:25							
Matrix: WATER							
Polyaromatic Hydrocarbons (PAHs)							
Naphthalene	0.000061		0.000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Phenanthrene	<0.000050		0.000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Pyrene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Quinoline	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
B(a)P Total Potency Equivalent	<0.000030		0.000030	mg/L	08-OCT-14	09-OCT-14	R2978719
Surrogate: Acenaphthene d10	89.9		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Acridine d9	99.0		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Chrysene d12	82.4		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Naphthalene d8	88.5		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Phenanthrene d10	93.4		40-130	%	08-OCT-14	09-OCT-14	R2978719
L1529266-3 CHAR RIVER							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 10:10							
Matrix: WATER							
BTEX plus F1-F4							
BTX plus F1 by GCMS							
Benzene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
Toluene	<0.0010		0.0010	mg/L		08-OCT-14	R2976408
Ethyl benzene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
o-Xylene	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
m+p-Xylenes	<0.00050		0.00050	mg/L		08-OCT-14	R2976408
F1 (C6-C10)	<0.10		0.10	mg/L		08-OCT-14	R2976408
Surrogate: 4-Bromofluorobenzene (SS)	103.6		70-130	%		08-OCT-14	R2976408
CCME Total Hydrocarbons							
F1-BTEX	<0.10		0.10	mg/L		09-OCT-14	
F2-Naphth	<0.25		0.25	mg/L		09-OCT-14	
F3-PAH	<0.25		0.25	mg/L		09-OCT-14	
Total Hydrocarbons (C6-C50)	<0.44		0.44	mg/L		09-OCT-14	
F2-F4 PHC method							
F2 (C10-C16)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
F3 (C16-C34)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
F4 (C34-C50)	<0.25		0.25	mg/L	08-OCT-14	08-OCT-14	R2978314
Surrogate: 2-Bromobenzotrifluoride	95.4		60-140	%	08-OCT-14	08-OCT-14	R2978314
Sum of Xylene Isomer Concentrations							
Xylenes (Total)	<0.0015		0.0015	mg/L		09-OCT-14	
Miscellaneous Parameters							
Ammonia, Total (as N)	<0.010		0.010	mg/L		09-OCT-14	R2978517
Phosphorus (P)-Total	<0.010		0.010	mg/L		09-OCT-14	R2978911
Total Kjeldahl Nitrogen	0.27		0.20	mg/L	08-OCT-14	09-OCT-14	R2979096
Polyaromatic Hydrocarbons (PAHs)							
1-Methyl Naphthalene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
2-Methyl Naphthalene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Acenaphthene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Acenaphthylene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Anthracene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Acridine	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(a)anthracene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(a)pyrene	<0.0000050		0.0000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(b&j)fluoranthene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(g,h,i)perylene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Benzo(k)fluoranthene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Chrysene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1529266-3 CHAR RIVER							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 10:10							
Matrix: WATER							
Polyaromatic Hydrocarbons (PAHs)							
Dibenzo(a,h)anthracene	<0.0000050		0.0000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Fluoranthene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Fluorene	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
Indeno(1,2,3-cd)pyrene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Naphthalene	<0.000050		0.000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Phenanthrene	<0.000050		0.000050	mg/L	08-OCT-14	09-OCT-14	R2978719
Pyrene	<0.000010		0.000010	mg/L	08-OCT-14	09-OCT-14	R2978719
Quinoline	<0.000020		0.000020	mg/L	08-OCT-14	09-OCT-14	R2978719
B(a)P Total Potency Equivalent	<0.000030		0.000030	mg/L	08-OCT-14	09-OCT-14	R2978719
Surrogate: Acenaphthene d10	82.7		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Acridine d9	90.8		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Chrysene d12	74.1		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Naphthalene d8	82.5		40-130	%	08-OCT-14	09-OCT-14	R2978719
Surrogate: Phenanthrene d10	85.6		40-130	%	08-OCT-14	09-OCT-14	R2978719
Routine Soluble + Metal scan							
Alkalinity							
Alkalinity, Total (as CaCO3)	25		20	mg/L		08-OCT-14	R2978494
Bicarbonate (HCO3)	30		24	mg/L		08-OCT-14	R2978494
Carbonate (CO3)	<12		12	mg/L		08-OCT-14	R2978494
Hydroxide (OH)	<6.8		6.8	mg/L		08-OCT-14	R2978494
Chloride by Ion Chromatography							
Chloride	22.4		0.50	mg/L		08-OCT-14	R2978909
Conductivity							
Conductivity	150		20	umhos/cm		08-OCT-14	R2978494
Hardness Calculated							
Hardness (as CaCO3)	35.7		0.30	mg/L		09-OCT-14	
Nitrate as N by Ion Chromatography							
Nitrate-N	<0.050		0.050	mg/L		08-OCT-14	R2978909
Nitrate+Nitrite							
Nitrate and Nitrite as N	<0.071		0.071	mg/L		09-OCT-14	
Nitrite as N by Ion Chromatography							
Nitrite-N	<0.050		0.050	mg/L		08-OCT-14	R2978909
Sulfate by Ion Chromatography							
Sulfate	8.99		0.50	mg/L		08-OCT-14	R2978909
TDS calculated							
TDS (Calculated)	73.8		5.0	mg/L		09-OCT-14	
Total Metals by ICP-MS							
Aluminum (Al)-Total	<0.020		0.020	mg/L	08-OCT-14	08-OCT-14	R2978241
Antimony (Sb)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Arsenic (As)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Barium (Ba)-Total	0.0149		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Beryllium (Be)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Bismuth (Bi)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Boron (B)-Total	<0.030		0.030	mg/L	08-OCT-14	08-OCT-14	R2978241
Cadmium (Cd)-Total	<0.00020		0.00020	mg/L	08-OCT-14	08-OCT-14	R2978241
Calcium (Ca)-Total	10.2		0.20	mg/L	08-OCT-14	08-OCT-14	R2978241
Cesium (Cs)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Chromium (Cr)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Cobalt (Co)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Copper (Cu)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Iron (Fe)-Total	<0.10		0.10	mg/L	08-OCT-14	08-OCT-14	R2978241
Lead (Pb)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1529266-3 CHAR RIVER							
Sampled By: MEGAN LUSTY on 07-OCT-14 @ 10:10							
Matrix: WATER							
Total Metals by ICP-MS							
Lithium (Li)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Magnesium (Mg)-Total	2.49		0.050	mg/L	08-OCT-14	08-OCT-14	R2978241
Manganese (Mn)-Total	0.0054		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Molybdenum (Mo)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Nickel (Ni)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Phosphorus (P)-Total	<0.50		0.50	mg/L	08-OCT-14	08-OCT-14	R2978241
Potassium (K)-Total	1.60		0.10	mg/L	08-OCT-14	08-OCT-14	R2978241
Rubidium (Rb)-Total	0.00203		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Selenium (Se)-Total	<0.0050		0.0050	mg/L	08-OCT-14	08-OCT-14	R2978241
Silicon (Si)-Total	<0.30		0.30	mg/L	08-OCT-14	08-OCT-14	R2978241
Silver (Ag)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Sodium (Na)-Total	13.4		0.050	mg/L	08-OCT-14	08-OCT-14	R2978241
Strontium (Sr)-Total	0.0547		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Tellurium (Te)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Thallium (Tl)-Total	<0.0050		0.0050	mg/L	08-OCT-14	08-OCT-14	R2978241
Thorium (Th)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Tin (Sn)-Total	<0.00060		0.00060	mg/L	08-OCT-14	08-OCT-14	R2978241
Titanium (Ti)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
Tungsten (W)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Uranium (U)-Total	<0.00050		0.00050	mg/L	08-OCT-14	08-OCT-14	R2978241
Vanadium (V)-Total	<0.0020		0.0020	mg/L	08-OCT-14	08-OCT-14	R2978241
Zinc (Zn)-Total	<0.020		0.020	mg/L	08-OCT-14	08-OCT-14	R2978241
Zirconium (Zr)-Total	<0.0010		0.0010	mg/L	08-OCT-14	08-OCT-14	R2978241
pH							
pH	7.63		0.10	pH units		08-OCT-14	R2978494

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

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TOT-WP	Water	Alkalinity	APHA 2320B

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.

BTEXS+F1-HSMS-WP	Water	BTX plus F1 by GCMS	EPA 8260C / EPA 5021A

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

CL-IC-WP	Water	Chloride by Ion Chromatography	EPA 300.1 (Modified)

Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.

EC-WP	Water	Conductivity	APHA 2510B

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.

ETL-HARDNESS-TOT-WP	Water	Hardness Calculated	HARDNESS CALCULATED
ETL-SOLIDS-CALC-WP	Water	TDS calculated	CALCULATION
F1-F4-CALC-WP	Water	CCME Total Hydrocarbons	CCME CWS-PHC DEC-2000 - PUB# 1310-L

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
In samples where BTEX and F1 were analyzed , F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:
1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:
1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F2-F4-FID-WP	Water	F2-F4 PHC method	CWS (CCME)

Petroleum Hydrocarbons (F2-F4) in Water Method is adapted from US EPA Method 3511: Organic Compounds in Water by Micro-extraction" (Nov 2002) with instrumental analysis as per the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method" (CCMS, Dec 2000) Water samples (in their entirety) are extracted using hexane prior to capillary column gas chromatography with flame ionization detection (GC/FID).

IONBALANCE-CALC-WP	Water	Ion Balance Calculation	APHA 1030E
MET-T-MS-WP	Water	Total Metals by ICP-MS	APHA 3030E/EPA 6020A-T

This analysis involves preliminary sample treatment by hotblock acid digestion (APHA 3030E). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

N-TOTKJ-WP	Water	Total Kjeldahl Nitrogen	Quickchem method 10-107-06-2-E Lachat

Samples are digested with a sulphuric acid solution, cooled, diluted with water, and analyzed for ammonia. Total Kjeldahl nitrogen is the sum of free-ammonia and organic nitrogen compounds which are converted to ammonium sulphate through this digestion process. Analysis is performed by Flow Injection
Analysis (FIA). The pH of the digested sample is raised to a known, basic pH by neutralization with a concentrated buffer solution. This neutralization converts the ammonium cation to ammonia. The ammonia produced is heated with saliclyate and hypochlorite to produce blue colour which is proportional to the ammonia concentration.

NH3-COL-WP	Water	Ammonia by colour	APHA 4500 NH3 F

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
Ammonia in water samples forms indophenol when reacted with hypochlorite and phenol. The intensity is amplified by the addition of sodium nitroprusside and measured colourmetrically.			
NO2+NO3-CALC-WP	Water	Nitrate+Nitrite	CALCULATION
NO2-IC-WP	Water	Nitrite as N by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
NO3-IC-WP	Water	Nitrate as N by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
P-T-COL-WP	Water	Phosphorus, Total	APHA 4500 P PHOSPHORUS
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PAH,PANH-WP	Water	Polyaromatic Hydrocarbons (PAHs)	EPA SW 846/8270-GC/MS
Water is spiked with a surrogate spike mix and extracted using solvent extraction techniques. Analysis is performed by GC/MS in the selected ion monitoring (SIM) mode.			
PH-WP	Water	pH	APHA 4500H
The 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-IC-WP	Water	Sulfate by Ion Chromatography	EPA 300.1 (Modified)
Anions in aqueous matrices are analyzed using ion chromatography with conductivity and/or UV absorbance detectors.			
XYLENES-SUM-CALC-WP	Water	Sum of Xylene Isomer Concentrations	CALCULATED RESULT
Total xylenes represents the sum of o-xylene and m&p-xylene.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

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
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting 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.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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ALS Environmental

Page 1 of 1

Report To	Report Format / Distribution	Service Request: (Rush subject to availability - Contact ALS to confirm TAT)
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Lab Work Order # (lab use only)	ALS Contact: Craig Riddel Sampler: Megan Lusty	

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	PAH	BTEX,F	F2-F4	BOD	Routine	Total Metals	Total Nutrients	Bacteria	Number of Containers
	Lower Loading Lake	07-10-14	9:50AM	water	✓	✓P	✓P	✓	✓	✓P	✓P	✓P	11
	Nipissar Lake	07-10-14	10:25AM	water	✓	✓P	✓P						6
	Chur River	07-10-14	10:10AM	water	✓	✓P	✓P	✓	✓	✓P	✓P	✓P	11

Special Instructions / Regulation with water or land use (CCME- Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC) / Hazardous Details

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Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Megan Lusty	07-10-14	10:35		7-10-14	4:25	3 °C				

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Guidelines for Canadian Drinking Water Quality
Summary Table

Prepared by the

Federal-Provincial-Territorial Committee on Drinking Water

of the

Federal-Provincial-Territorial Committee on Health and the Environment

August 2012

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Other documents for the Guidelines for Canadian Drinking Water Quality can be found on the following web page:
www.healthcanada.gc.ca/waterquality

Table of Contents

Introduction

The Guidelines for Canadian Drinking Water Quality are established by the Federal-Provincial-Territorial Committee on Drinking Water (CDW) and published by Health Canada. This summary table is updated regularly and published on Health Canada's website (www.healthcanada.gc.ca/waterquality). It supersedes all previous electronic and printed versions, including the 6th edition of the Guidelines for Canadian Drinking Water Quality (1996).

Each guideline was established based on current, published scientific research related to health effects, aesthetic effects, and operational considerations. Health-based guidelines are established on the basis of comprehensive review of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical technologies. Aesthetic effects (e.g., taste, odour) are taken into account when these play a role in determining whether consumers will consider the water drinkable. Operational considerations are factored in when the presence of a substance may interfere with or impair a treatment process or technology (e.g., turbidity interfering with chlorination or UV disinfection) or adversely affect drinking water infrastructure (e.g., corrosion of pipes).

The Federal-Provincial-Territorial Committee on Drinking Water establishes the *Guidelines for Canadian Drinking Water Quality* specifically for contaminants that meet all of the following criteria:

1. exposure to the contaminant could lead to adverse health effects in humans;
2. the contaminant is frequently detected or could be expected to be found in a large number of drinking water supplies throughout Canada; and
3. the contaminant is detected, or could be expected to be detected, in drinking water at a level that is of possible human health significance.

If a contaminant of interest does not meet all these criteria, CDW may choose not to establish a numerical guideline or develop a Guideline Technical Document. In that case, a Guidance Document may be developed.

Older guidelines are systematically reviewed in order to assess the need to update them; in the tables, guidelines that have been reaffirmed include both the original approval and reaffirmation year indicated after the name of the parameter.

Science-based documents published as part of the Guidelines for Canadian Drinking Water Quality (i.e., Guideline Technical Documents, Guidance Documents) are developed through a documented process which includes a literature review, internal and external peer-reviews, public consultations and Federal-Provincial-Territorial approval processes. For more information on specific guidelines, please refer to the guideline technical document or guidance document for the parameter of concern, available on the Health Canada website (www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php).

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Tables

Table 1. Microbiological Parameters

In general, the highest-priority guidelines are those dealing with microbiological contaminants, such as bacteria, protozoa and viruses. As a result of challenges with routine analysis of harmful microorganisms that could potentially be present in inadequately treated drinking water, the microbiological guidelines focus on indicators (*E.coli*, total coliforms) and treatment goals. The use of a multi-barrier approach that includes source water protection, adequate treatment, including disinfection, and a well-maintained distribution system can reduce microorganisms to levels that have not been associated with illness, as well as meet the guidelines outlined below.

Parameter (approval)	Guideline	Common sources	Health considerations	Applying the guideline
Bacterial waterborne pathogens (2006)	None required	Human and animal faeces; some are naturally occurring	Commonly associated with gastrointestinal upset (nausea, vomiting, diarrhoea); some pathogens may infect the lungs, skin, eyes, central nervous system or liver.	Use multi-barrier approach to reduce pathogens to levels that are non-detectable or not associated with illness.
Enteric viruses (2011)	Treatment goal: Minimum 4 log reduction and/or inactivation of enteric viruses	Human and animal faeces	Commonly associated with gastrointestinal upset (nausea, vomiting, diarrhoea); less common health effects can include respiratory symptoms, central nervous system infections, liver infections and muscular syndromes.	Routine monitoring for viruses is not practical; where possible, characterize source water to determine if greater than a 4 log removal or inactivation is necessary.
Escherichia coli (*E. coli*) (2006)	MAC: None detectable per 100 mL	Human and animal faeces	The presence of *E. coli* indicates recent faecal contamination and the potential presence of microorganisms capable of causing gastrointestinal illnesses; pathogens in human and animal faeces pose the most immediate danger to public health.	*E. coli* is used as an indicator of the microbiological safety of drinking water; if detected, enteric pathogens may also be present.
Heterotrophic plate count (HPC) (2006)	None required	Naturally occurring	HPC results are not an indicator of water safety and should not be used as an indicator of potential adverse human health effects; HPC is a useful operational tool for monitoring general bacteriological water quality through the treatment process and in the distribution system.	If increases in HPC values above baseline levels occur, the system should be inspected to determine the cause; HPC should be minimized through effective treatment and disinfection and remain constant over time.
Protozoa: *Giardia* and *Cryptosporidium* (2004)	Treatment goal: Minimum 3 log reduction and/or inactivation	Human and animal faeces	Commonly associated with gastrointestinal upset (nausea, vomiting, diarrhoea); less common health effects can include respiratory symptoms, central nervous system infections, liver infections and muscular syndromes.	Monitoring for *Cryptosporidium* and *Giardia* in source waters will provide valuable information for assessing treatment requirements.

Parameter (approval)	Guideline	Common sources	Health considerations	Applying the guideline
Total coliforms (2006)	*At exit of municipal treatment plant or throughout semi-public systems*: MAC of none detectable/100 mL *In municipal distribution systems*: No consecutive samples or no more than 10% of samples should contain total coliforms	Human and animal faeces; naturally occurring in water, soil and vegetation	Total coliforms are not used as indicators of potential health effects from pathogenic microorganisms; they are used as an operational tool to determine how well the drinking water treatment system is operating.	In water leaving a treatment plant, the presence of total coliforms indicates that the water has been inadequately treated and may contain pathogenic microorganisms; in semi-public systems, the presence of total coliforms generally indicates that the system is vulnerable to contamination and that additional actions need to be taken; in a distribution and storage system, detection of total coliforms can indicate regrowth of the bacteria in distribution system biofilms or intrusion of untreated water; thus, exceedances of the distribution system goal should be investigated.
Turbidity (2003)	Guideline Treated water < 0.1 NTU[1] at all times. Where not achievable: ≤ 0.3 NTU[2] ≤ 1.0 NTU[3] ≤ 0.1 NTU[4]	Naturally occurring particles: *Inorganic*: clays, silts, metal precipitates *Organic*: decomposed plant & animal debris, microorganisms	Indirect associations: particles can harbour microorganisms, protecting them from disinfection, and can entrap heavy metals and biocides; elevated or fluctuating turbidity in filtered water can indicate a problem with the water treatment process and a potential increased risk of pathogens in treated water.	Guidelines apply to individual filter turbidity for systems that use surface water or GUDI; drinking water from some sources may meet exemption criteria from filtration requirements established by the appropriate authority; increases in distribution system turbidity can be indicative of deteriorating water quality and should be investigated.

[1] Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times

[2] Chemically assisted filtration: ≤ 0.3 NTU in at least 95% of a) measurements made or b) the time each calendar month; never to exceed 1.0 NTU.

[3] Slow sand or diatomaceous earth filtration: ≤ 1.0 NTU in at least 95% of a) measurements made or b) the time each calendar month; never to exceed 3.0 NTU.

[4] Membrane filtration: ≤ 0.1 NTU in at least 99% of a) measurements made or b) the time each calendar month; never to exceed 0.3 NTU.

Table 2. Chemical and Physical Parameters

Guidelines for chemical and physical parameters are:

1. health based and listed as a maximum acceptable concentrations (MAC);
2. based on aesthetic considerations and listed as an aesthetic objectives (AO); or
3. established based on operational considerations and listed as an operational guidance values (OG).

In general, the highest priority guidelines are those dealing with microbiological contaminants. Any measure taken to reduce concentrations of chemical contaminants should not compromise the effectiveness of disinfection.

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
T	Aluminum (1998)		OG: < 0.1 (conventional treatment); < 0.2 (other treatment types)	Aluminum salts used as coagulants in drinking water treatment; naturally occurring		Current weight of evidence does not indicate adverse health effects at levels found in drinking water.
I	Ammonia (1987)	None required		Naturally occurring; released from agricultural or industrial wastes; added as part of chloramination for drinking water disinfection		Guideline value not necessary as it is produced in the body and efficiently metabolized in healthy people; no adverse effects at levels found in drinking water.
I	Antimony (1997)	0.006		Naturally occurring (erosion); soil runoff; industrial effluents; leaching from plumbing materials and solder	**Health basis of MAC:** Microscopic changes in organs and tissues (thymus, kidney, liver, spleen, thyroid)	MAC takes into consideration analytical achievability; plumbing should be thoroughly flushed before water is used for consumption.
I	Arsenic (2006)	0.010 ALARA		Naturally occurring (erosion and weathering of soils, minerals, ores)	**Health basis of MAC:** Cancer (lung, bladder, liver, skin) (classified as human carcinogen) **Other:** Skin, vascular and neurological effects (numbness and tingling of extremities)	MAC based on treatment achievability; elevated levels associated with certain groundwaters; levels should be kept as low as reasonably achievable.

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I	Asbestos (1989, 2005)	None required		Naturally occurring (erosion of asbestos minerals and ores); decay of asbestos-cement pipes		Guideline value not necessary; no evidence of adverse health effects from exposure through drinking water.
P	Atrazine (1993)	0.005		Leaching and/or runoff from agricultural use	**Health basis of MAC:** Developmental effects (reduced body weight of offspring) **Other:** Potential increased risk of ovarian cancer or lymphomas (classified as possible carcinogen)	MAC applicable to the sum of atrazine and its *N*-dealkylated metabolites; persistent in source waters.
P	Azinphos-methyl (1989, 2005)	0.02		Leaching and/or runoff from agricultural use	**Health basis of MAC:** Neurological effects (plasma cholinesterase)	All uses to be phased out by 2012.
I	Barium (1990)	1.0		Naturally occurring; releases or spills from industrial uses	**Health basis of MAC:** Increases in blood pressure, cardiovascular disease	
O	Benzene (2009)	0.005		Releases or spills from industrial uses	**Health basis of MAC:** Bone marrow (red and white blood cell) changes and cancer (classified as human carcinogen) **Other:** Blood system and immunological responses	MAC considers additional exposure through showering and bathing; drinking water is generally a minor source of exposure.
O	Benzo[*a*]pyrene (1988, 2005)	0.000 01		Leaching from liners in water distribution systems	**Health basis of MAC:** Stomach tumours (classified as probable carcinogen)	
I	Boron (1990)	5		Naturally occurring; leaching or runoff from industrial use	**Health basis of MAC:** Reproductive effects (testicular atrophy, spermatogenesis) **Other:** Limited evidence of reduced sexual function in men	MAC based on treatment achievability.
DBP	Bromate (1998)	0.01		By-product of drinking water disinfection with ozone; possible contaminant in hypochlorite solution	**Health basis of MAC:** Renal cell tumours (classified as probable carcinogen)	MAC based on analytical and treatment achievability
P	Bromoxynil (1989, 2005)	0.005		Leaching or runoff from agricultural use	**Health basis of MAC:** Reduced liver to body weight ratios	

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I	Cadmium (1986, 2005)	0.005		Leaching from galvanized pipes, solders or black polyethylene pipes; industrial and municipal waste	**Health basis of MAC:** Kidney damage and softening of bone	
I	Calcium (1987, 2005)	None required		Naturally occurring (erosion and weathering of soils, minerals, ores)		Guideline value not necessary, as there is no evidence of adverse health effects from calcium in drinking water; calcium contributes to hardness
P	Carbaryl (1991, 2005)	0.09		Leaching or runoff from agricultural use	**Health basis of MAC:** Decreased kidney function (may be rapidly reversible after exposure ceases)	
P	Carbofuran (1991, 2005)	0.09		Leaching or runoff from agricultural use	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition) and growth suppression	
O	Carbon tetrachloride (2010)	0.002		Industrial effluents and leaching from hazardous waste sites	**Health basis of MAC:** Liver toxicity **Other:** Kidney damage; liver tumours (classified as probable carcinogen)	MAC considers additional exposure through showering and bathing
D	Chloramines (1995)	3.0		Monochloramine is used as a secondary disinfectant; formed in presence of both chlorine and ammonia	**Health basis of MAC:** Reduced body weight gain **Other:** immunotoxicity effects	MAC is for total chloramines based on health effects associated with monochloramine and analytical achievability
DBP	Chlorate (2008)	1		By-product of drinking water disinfection with chlorine dioxide; possible contaminant in hypochlorite solution	**Health basis of MAC:** Thyroid gland effects (colloid depletion)	Formation of chlorate ion should be prevented, as it is difficult to remove once formed; chlorate formation should be controlled by respecting the maximum feed dose of 1.2 mg/L of chlorine dioxide and managing /monitoring formation in hypochlorite solutions.
I	Chloride (1979, 2005)		AO: ≤ 250	Naturally occurring (seawater intrusion); dissolved salt deposits, highway salt, industrial effluents, oil well operations, sewage, irrigation drainage, refuse leachates		Based on taste and potential for corrosion in the distribution system

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
D	Chlorine (2009)	None required		Used as drinking water disinfectant	Guideline value not necessary due to low toxicity at concentrations found in drinking water	Free chlorine concentrations in most Canadian drinking water distribution systems range from 0.04 to 2.0 mg/L
D	Chlorine dioxide (2008)	None required		Used as drinking water disinfectant	A guideline for chlorine dioxide is not required because of its rapid reduction to chlorite in drinking water	A maximum feed dose of 1.2 mg/L of chlorine dioxide should not be exceeded to control the formation of chlorite and chlorate
DBP	Chlorite (2008)	1		By-product of drinking water disinfection with chlorine dioxide	**Health basis of MAC:** Neurobehavioural effects (lowered auditory startle amplitude, decreased exploratory activity), decreased absolute brain weight, altered liver weights	Chlorite formation should be controlled by respecting the maximum feed dose of 1.2 mg/L of chlorine dioxide and managing /monitoring formation in hypochlorite solutions.
P	Chlorpyrifos (1986)	0.09		Leaching and/or runoff from agricultural or other uses	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition)	Not expected to leach significantly into groundwater
I	Chromium (1986)	0.05		Naturally occurring (erosion of minerals); releases or spills from industrial uses	**Health basis of MAC:** Enlarged liver, irritation of the skin, respiratory and gastrointestinal tracts from chromium (VI)	Chromium (III) is an essential element; MAC is protective of health effects from chromium (VI)
T	Colour (1979, 2005)		AO: ≤ 15 TCU	Naturally occurring organic substances, metals; industrial wastes		May interfere with disinfection; removal is important to ensure effective treatment
I	Copper (1992)		AO: ≤ 1.0	Naturally occurring; leaching from copper piping	Copper is an essential element in human metabolism. Adverse health effects occur at levels much higher than the aesthetic objective	Based on taste, staining of laundry and plumbing fixtures; plumbing should be thoroughly flushed before water is used for consumption
I	Cyanide (1991)	0.2		Industrial and mining effluents; release from organic compounds	**Health basis of MAC:** No clinical or other changes at the highest dose tested	Health effects from cyanide are acute; at low levels of exposure, it can be detoxified to a certain extent in the human body
O	Cyanobacterial toxins—Microcystin-LR (2002)	0.0015		Naturally occurring (released from blooms of blue-green algae)	**Health basis of MAC:** Liver effects (enzyme inhibitor) **Other:** Classified as possible carcinogen	MAC is protective of total microcystins; avoid algicides like copper sulphate, as they may cause toxin release into water

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
P	Diazinon (1986, 2005)	0.02		Runoff from agricultural or other uses	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition)	Not expected to leach significantly into groundwater
P	Dicamba (1987, 2005)	0.12		Leaching or runoff from agricultural or other uses	**Health basis of MAC:** Liver effects (vacuolization, necrosis, fatty deposits and liver weight changes)	Readily leaches into groundwater
O	1,2-Dichlorobenzene[2] (1987)	0.2	AO: ≤ 0.003	Releases or spills from industrial effluents	**Health basis of MAC:** Increased blood cholesterol, protein and glucose levels	AO based on odour; levels above the AO would render drinking water unpalatable
O	1,4-Dichlorobenzene[2] (1987)	0.005	AO: ≤ 0.001	Releases or spills from industrial effluents; use of urinal deodorants	**Health basis of MAC:** Benign liver tumours and adrenal gland tumours (classified as probable carcinogen)	AO based on odour; levels above the AO would render drinking water unpalatable
O	1,2-Dichloroethane (1987)	0.005		Releases or spills from industrial effluents; waste disposal	**Health basis of MAC:** Cancer of the circulatory system (classified as probable carcinogen)	MAC based on treatment and analytical achievability
O	1,1-Dichloroethylene (1994)	0.014		Releases or spills from industrial effluents	**Health basis of MAC:** Liver effects (fatty changes)	
O	Dichloromethane (2011)	0.05		Industrial and municipal wastewater discharges	**Health basis of MAC:** Liver effects (liver foci and areas of cellular alteration). **Other:** Classified as probable carcinogen	MAC is protective of carcinogenic effects and considers additional exposure through showering and bathing
O	2,4-Dichlorophenol (1987, 2005)	0.9	AO: ≤ 0.0003	By-product of drinking water disinfection with chlorine; releases from industrial effluents	**Health basis of MAC:** Liver effects (cellular changes)	AO based on odour; levels above the AO would render drinking water unpalatable
P	2,4-Dichlorophenoxy acetic acid (2,4-D) (1991)	0.1		Leaching and/or runoff from use as a weed controller; releases from industrial effluents	**Health basis of MAC:** Kidney effects (tubular cell pigmentation)	

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
P	Diclofop-methyl (1987, 2005)	0.009		Leaching and/or runoff from use as a weed controller; added directly to water to control aquatic weeds	**Health basis of MAC:** Liver effects (enlargement and enzyme changes)	Low potential for groundwater contamination
P	Dimethoate (1986, 2005)	0.02		Leaching and/or runoff from residential, agricultural and forestry use	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition)	
P	Diquat (1986, 2005)	0.07		Leaching and/or runoff from agricultural use; added directly to water to control aquatic weeds	**Health basis of MAC:** Cataract formation	Unlikely to leach into groundwater
P	Diuron (1987, 2005)	0.15		Leaching and/or runoff from use in controlling vegetation	**Health basis of MAC:** Weight loss, increased liver weight and blood effects	High potential to leach into groundwater
O	Ethylbenzene (1986, 2005)		AO: ≤ 0.0024	Emissions, effluents or spills from petroleum and chemical industries		Based on odour
I	Fluoride (2010)	1.5		Naturally occurring (rock and soil erosion); may be added to promote dental health	**Health basis of MAC: M**oderate dental fluorosis (based on cosmetic effect, not health)	Beneficial in preventing dental caries
DBP	Formaldehyde (1997)	None required		By-product of disinfection with ozone; releases from industrial effluents		Guideline value not necessary, as levels in drinking water are below the level at which adverse health effects may occur
O	Gasoline and its organic constituents (1986, 2005)	None required		Spill or leaking storage tank		No MAC due to complex composition of gasoline; strong taste and odour at concentrations well below those potentially eliciting adverse health effects (see benzene, ethylbenzene, toluene and xylenes for more information)
P	Glyphosate (1987, 2005)	0.28		Leaching and/or runoff from various uses in weed control	**Health basis of MAC:** Reduced body weight gain	Not expected to migrate to groundwater

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
DBP	Haloacetic acids – Total (HAAs)[3] (2008)	0.08 ALARA		By-product of drinking water disinfection with chlorine	**Health basis of MAC:** Liver cancer (DCA); DCA is classified as probably carcinogenic to humans **Other:** Other organ cancers (DCA, DBA, TCA); liver and other organ effects (body, kidney and testes weights) (MCA)	Refers to the total of monochloroacetic acid (MCA), dichloroacetic acid (DCA), trichloroacetic acid (TCA), monobromoacetic acid (MBA) and dibromoacetic acid (DBA); MAC is based on ability to achieve HAA levels in distribution systems without compromising disinfection; precursor removal limits formation
T	Hardness (1979)	None required		Naturally occurring (sedimentary rock erosion and seepage, runoff from soils); levels generally higher in groundwater	Although hardness may have significant aesthetic effects, a guideline has not been established because public acceptance of hardness may vary considerably according to the local conditions; major contributors to hardness -- calcium and magnesium -- are not of direct public health concern	Hardness levels between 80 and 100 mg/L (as $CaCO_3$) provide acceptable balance between corrosion and incrustation; where a water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended
I	Iron (1978, 2005)		AO: ≤ 0.3	Naturally occurring (erosion and weathering of rocks and minerals); acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries		Based on taste and staining of laundry and plumbing fixtures; no evidence exists of dietary iron toxicity in the general population
I	Lead (1992)	0.010		Leaching from plumbing (pipes, solder, brass fittings and lead service lines)	**Health basis of MAC:** Biochemical and neurobehavioural effects (intellectual development, behaviour) in infants and young children (under 6 years) **Other:** Anaemia, central nervous system effects; in pregnant women, can affect the unborn child; in infants and children under 6 years, can affect intellectual development, behaviour, size and hearing; classified as probably carcinogenic to humans	Because the MAC is based on chronic effects, it is intended to apply to average concentrations in water consumed for extended periods. Exposure to lead should nevertheless be kept to a minimum; plumbing should be thoroughly flushed before water is used for consumption; most significant contribution is generally from lead service line entering the building

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I	Magnesium (1978)	None required		Naturally occurring (erosion and weathering of rocks and minerals)		Guideline value not necessary, as there is no evidence of adverse health effects from magnesium in drinking water
P	Malathion (1986, 2005)	0.19		Leaching and/or runoff from agricultural and other uses	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition)	Not expected to leach into groundwater
I	Manganese (1987)		AO: ≤ 0.05	Naturally occurring (erosion and weathering of rocks and minerals)		Based on taste and staining of laundry and plumbing fixtures
I	Mercury (1986)	0.001		Releases or spills from industrial effluents; waste disposal; irrigation or drainage of areas where agricultural pesticides are used	**Health basis of MAC:** Irreversible neurological symptoms	Applies to all forms of mercury; mercury generally not found in drinking water, as it binds to sediments and soil
P	2-Methyl-4-chlorophenoxyacetic acid (MCPA) (2010)	0.1		Leaching and/or runoff from agricultural and other uses	**Health basis of MAC:** Kidney effects (increased absolute and relative weights, urinary bilirubin, crystals and pH) **Other:** Systemic, liver, testicular, reproductive/developmental and nervous system effects	Can potentially leach into groundwater
O	Methyl tertiary-butyl ether (MTBE) (2006)		AO: ≤ 0.015	Spills from gasoline refineries, filling stations and gasoline-powered boats; seepage into groundwater from leaking storage tanks	There exist too many uncertainties and limitations in the MTBE database to develop a health based guideline.	AO based on odour; levels above the AO would render water unpalatable; as the AO is lower than levels associated with potential toxicological effects, it is considered protective of human health.
P	Metolachlor (1986)	0.05		Leaching and/or runoff from agricultural or other uses	**Health basis of MAC:** Liver lesions and nasal cavity tumours	Readily binds to organic matter in soil; little leaching expected in soils with high organic and clay content
P	Metribuzin (1986, 2005)	0.08		Leaching and/or runoff from agricultural use	**Health basis of MAC:** Liver effects (increased incidence and severity of mucopolysaccharide droplets)	Leaching into groundwater depends on the organic matter content of the soil
O	Monochlorobenzene (1987)	0.08	AO: ≤ 0.03	Releases or spills from industrial effluents	**Health basis of MAC:** Reduced survival and body weight gain	AO based on odour; levels above the AO would render water unpalatable

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
I	Nitrate/nitrite (1987)	*Nitrate*: 45 as nitrate; 10 as nitrate-nitrogen	*Nitrite (if measured separately)*: 3.2 as nitrite; 1.0 as nitrite-nitrogen	Naturally occurring; leaching or runoff from agricultural fertilizer use, manure and domestic sewage; may be produced from excess ammonia or from microbial activity in distribution systems	**Health basis of MAC:** Methaemoglobinaemia (blue baby syndrome) in infants less than 3 months old (short term) **Other:** Classified as possible carcinogen	MACs are protective of children and adults; systems using chloramine disinfection or that have naturally occurring ammonia should monitor nitrite and nitrate in distribution system
I	Nitrilotriacetic acid (NTA) (1990)	0.4		Sewage contamination	**Health basis of MAC:** Kidney effects (nephritis and nephrosis) **Other:** Classified as possible carcinogen	
DBP	*N*-Nitroso dimethylamine (NDMA) (2010)	0.000 04		By-product of drinking water disinfection with chlorine or chloramines; industrial and sewage treatment plant effluents	**Health basis of MAC:** Liver cancer (classified as probable carcinogen)	MAC considers additional exposure through showering and bathing; levels should be kept low by preventing formation during treatment
A	Odour (1979, 2005)		Inoffensive	Biological or industrial sources		Important to provide drinking water with no offensive odour, as consumers may seek alternative sources that are less safe
P	Paraquat (1986, 2005)	0.01 as paraquat dichloride; 0.007 as paraquat ion		Leaching and/or runoff from agricultural and other uses; added directly to water to control aquatic weeds	**Health basis of MAC:** Various effects on body weight, spleen, testes, liver, lungs, kidney, thyroid, heart and adrenal gland	Entry into drinking water unlikely from crop applications (clay binding); however, may persist in water for several days if directly applied to water
O	Pentachlorophenol (1987, 2005)	0.06	AO: ≤ 0.03	By-product of drinking water disinfection with chlorine; industrial effluents	**Health basis of MAC:** Reduced body weight, changes in clinical parameters, histological changes in kidney and liver, reproductive effects (decreased neonatal survival and growth)	AO based on odour; levels above the AO would render drinking water unpalatable
T	pH (1979)		6.5–8.5[4]	Not applicable		pH can influence the formation of disinfection by-products and effectiveness of treatment

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
P	Phorate (1986, 2005)	0.002		Leaching and/or runoff from agricultural and other uses	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition)	Some potential to leach into groundwater
P	Picloram (1988, 2005)	0.19		Leaching and/or runoff from agricultural and other uses	**Health basis of MAC:** Changes in body and liver weights and clinical chemistry parameters **Other:** Kidney effects (liver to body weight ratios and histopathology)	Significant potential to leach into groundwater
I	Selenium (1992)	0.01		Naturally occurring (erosion and weathering of rocks and soils)	**Health basis of MAC:** Essential nutritional element **Other:** Hair loss and weakened nails at extremely high levels of exposure	Most exposure from food; little information on toxicity of selenium from drinking water
I	Silver (1986, 2005)	None required		Naturally occurring (erosion and weathering of rocks and soils)		Guideline value not required as drinking water contributes negligibly to an individual's daily intake
P	Simazine (1986)	0.01		Leaching and/or runoff from agricultural and other uses	**Health basis of MAC:** Body weight changes and effects on serum and thyroid gland	Extent of leaching decreases with increasing organic matter and clay content
I	Sodium (1979)		AO: ≤ 200	Naturally occurring (erosion and weathering of salt deposits and contact with igneous rock, seawater intrusion); sewage and industrial effluents; sodium-based water softeners		Based on taste; where a sodium-based water softener is used, a separate unsoftened supply for cooking and drinking purposes is recommended
I	Sulphate (1994)		AO: ≤ 500	Industrial wastes	High levels (above 500 mg/L) can cause physiological effects such as diarrhoea or dehydration	Based on taste; health authorities should be notified of drinking water sources containing above 500 mg/L
I	Sulphide (1992)		AO: ≤ 0.05	Can occur in the distribution system from the reduction of sulphates by sulphate-reducing bacteria; industrial wastes		Based on taste and odour; levels above the AO would render water unpalatable
A	Taste (1979, 2005)		Inoffensive	Biological or industrial sources		Important to provide drinking water with no offensive taste, as consumers may seek alternative sources that are less safe

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
T	Temperature (1979, 2005)		AO: ≤ 15°C	Not applicable		Temperature indirectly affects health and aesthetics through impacts on disinfection, corrosion control and formation of biofilms in the distribution system
P	Terbufos (1987, 2005)	0.001		Leaching and/or runoff from agricultural and other uses	**Health basis of MAC:** Nervous system effects (cholinesterase inhibition)	Based on analytical achievability
O	Tetrachloroethylene (1995)	0.03		Industrial effluents or spills	**Health basis of MAC:** Increased liver and kidney weights **Other:** Classified as possible carcinogen; limited evidence of an increased risk of spontaneous abortion	Readily leaches into groundwater; MAC considers additional exposure through showering and bathing
O	2,3,4,6-Tetrachlorophenol (1986, 2005)	0.1	AO: ≤ 0.001	By-product of drinking water disinfection with chlorine; industrial effluents and use of pesticides	**Health basis of MAC:** Developmental effects (embryotoxicity)	AO based on odour; levels above the AO would render drinking water unpalatable
O	Toluene (1986, 2005)		AO: ≤ 0.024	Release of effluents or spills from petroleum and chemical industries		AO based on odour; levels above the AO would render drinking water unpalatable
A	Total dissolved solids (TDS) (1991)		AO: ≤ 500	Naturally occurring; sewage, urban and agricultural runoff, industrial wastewater		Based on taste; TDS above 500 mg/L results in excessive scaling in water pipes, water heaters, boilers and appliances; TDS is composed of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulphate and nitrate
O	Trichloroethylene (2005)	0.005		Industrial effluents and spills from improper disposal	**Health basis of MAC:** Developmental effects (heart malformations) **Other:** Classified as probable carcinogen	MAC considers additional exposure through showering and bathing
O	2,4,6-Trichlorophenol (1987, 2005)	0.005	AO: ≤ 0.002	By-product of drinking water disinfection with chlorine; industrial effluents and spills	**Health basis of MAC:** Liver cancer (classified as probable carcinogen)	AO based on odour; levels above the AO would render drinking water unpalatable

Type[1]	Parameter (approval, reaffirmation)	MAC (mg/L)	Other value (mg/L)	Common sources of parameter in water	Health considerations	Comments
P	Trifluralin (1989, 2005)	0.045		Runoff from agricultural uses	**Health basis of MAC:** Changes in liver and spleen weights and in serum chemistry	Unlikely to leach into groundwater
DBP	Trihalomethanes[3] (THMs) (2006)	0.1		By-product of drinking water disinfection with chlorine; industrial effluents	**Health basis of MAC:** Liver effects (fatty cysts) (chloroform classified as possible carcinogen) **Other:** Kidney and colorectal cancers	Considers the most commonly found THMs, namely chlorodibromomethane, chloroform, bromodichloromethane and bromoform; MAC based on health effects of chloroform and considers additional exposure through showering and bathing; precursor removal limits formation
I	Uranium (1999)	0.02		Naturally occurring (erosion and weathering of rocks and soils); mill tailings; emissions from nuclear industry and combustion of coal and other fuels; phosphate fertilizers	**Health basis of MAC:** Kidney effects (various lesions); may be rapidly reversible after exposure ceases	Based on treatment achievability; MAC based on chemical effects, as uranium is only weakly radioactive; uranium is rapidly eliminated from the body
O	Vinyl chloride (1992)	0.002		Industrial effluents; degradation product from trichloroethylene and tetrachloroethylene in groundwater; leaching from polyvinyl chloride pipes	**Health basis of MAC:** Liver cancer (classified as human carcinogen) **Other:** Raynaud's disease, effects on bone, circulatory system, thyroid, spleen, central nervous system	Based on treatment and analytical achievability; leaching from polyvinyl chloride pipe is not expected to be significant
O	Xylene (1986, 2005)		AO: ≤ 0.3	Industrial effluents and spills		AO based on taste and odour; levels above the AO would render water unpalatable
I	Zinc (1979, 2005)		AO: ≤ 5.0	Naturally occurring; industrial and domestic emissions; leaching may occur from galvanized pipes, hot water tanks and brass fittings		AO based on taste; water with zinc levels above the AO tends to be opalescent and develops a greasy film when boiled; plumbing should be thoroughly flushed before water is consumed

[1] Parameter types: A – Acceptability; D – Dinsinfectant; DBP – Disinfection by-product; P – Pesticide; I – Inorganic chemical; O – Organic chemical; P – Pesticide; Treatment related parameter.

[2] In cases where total dichlorobenzenes are measured and concentrations exceed the most stringent value (0.005 mg/L), the concentrations of the individual isomers should be established.

[3] Expressed as a locational running annual average of quarterly samples.

[4] No units.

Table 3. Radiological Parameters

Guidelines for radiological parameters focus on routine operational conditions of existing and new water supplies and do not apply in the event of contamination during an emergency involving a large release of radionuclides into the environment. Maximum acceptable concentrations (MACs) have been established for the most commonly detected natural and artificial radionuclides in Canadian drinking water sources, using internationally accepted equations and principles and based solely on health considerations.

The MACs are based on exposure solely to a specific radionuclide. The radiological effects of two or more radionuclides in the same drinking water source are considered to be additive. Thus, the sum of the ratios of the observed concentration to the MAC for each contributing radionuclide should not exceed 1.

Water samples may be initially analysed for the presence of radioactivity using gross alpha and gross beta screening rather than measurements of individual radionuclides. If screening levels are exceeded (0.5 Bq/L for gross alpha and 1.0 Bq/L for gross beta), then concentrations of specific radionuclides should be analysed. A guideline for radon is not deemed necessary and has not been established. Information on radon is presented because of its significance for indoor air quality in certain situations.

Parameter (approval)	MAC (Bq/L)	Common sources	Health basis of MAC	Comments
Cesium-137 (2009)	10	Nuclear weapons fallout and emissions from nuclear reactors	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Iodine-131 (2009)	6	Sewage effluent	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Lead-210 (2009)	0.2	Naturally occurring (decay product of radon)	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	Corresponds to total lead concentration of 7×10^{-8} µg/L
Radium-226 (2009)	0.5	Naturally occurring	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Radon (2009)	None required	Naturally occurring (leaching from radium-bearing rocks and soils; decay product of radium-226)	Health risk from ingestion considered negligible due to high volatility	Mainly a groundwater concern; if concentrations in drinking water exceed 2000 Bq/L actions should be taken to reduce release into indoor air (e.g. proper venting of drinking water supply)
Strontium-90 (2009)	5	Nuclear weapons fallout	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	
Tritium (2009)	7000	Naturally occurring (cosmogenic radiation); releases from nuclear reactors	Cancer of the lung, breast, thyroid, bone, digestive organs and skin; leukaemia	Not removed by drinking water treatment

Table 4. Guidance Documents

In certain situations, the Federal-Provincial-Territorial Committee on Drinking Water may choose to develop guidance documents for contaminants that do not meet the criteria for guideline development and for specific issues for which operational or management guidance is warranted. These documents are offered as information for drinking water authorities and help provide guidance relating to contaminants, drinking water management issues or emergency situations.

Parameter/subject (approval)	Comments
Issuing and rescinding boil water advisories (2009)	Summarizes factors for consideration when responsible authorities issue or rescind boil water advisories
Chloral hydrate in drinking water (2008)	Exposure levels in Canada far below concentration that would cause health effects; levels above 0.2 mg/L may indicate a concern for health effects and should be investigated
Controlling corrosion in drinking water distribution systems (2009)	Addresses strategies to deal with leaching of lead from materials in the distribution system; sampling protocols can be used to assess corrosion and the effectiveness of remediation/control measures to reduce lead levels in drinking water; corrective measures are outlined to address lead sources
Issuing and rescinding drinking water avoidance advisories in emergency situations (2009)	Summarizes factors for consideration when responsible authorities issue or rescind drinking water avoidance advisories in emergency situations
Potassium from water softeners (2008)	Not a concern for general population; those with kidney disease or other conditions, such as heart disease, coronary artery disease, hypertension or diabetes, and those who are taking medications that interfere with normal body potassium handling should avoid the consumption of water treated by water softeners using potassium chloride

Table 5. Archived Documents

The Federal-Provincial-Territorial Committee on Drinking Water has established a science-based process to systematically review older guidelines and archive those that are no longer required. Guidelines are archived for parameters that are no longer found in Canadian drinking water supplies at levels that could pose a risk to human health, including pesticides that are no longer registered for use in Canada and for mixtures of contaminants that are addressed individually.

Parameter	Type
Aldicarb	Pesticide
Aldrin + dieldrin	Pesticide
Bendiocarb	Pesticide
Cyanazine	Pesticide
Dinoseb	Pesticide
Gasoline and its organic constituents	Organic chemical
Methoxychlor	Pesticide

Acronyms

A	acceptability (parameter type)
ALARA	as low as reasonably achievable
AO	aesthetic objective
CDW	Committee on Drinking Water (FPT)
D	disinfectant (parameter type)
DBP	disinfectant by-product (parameter type)
HPC	heterotrophic plate count
I	inorganic chemical (parameter type)
MAC	maximum acceptable concentration
NTU	nephelometric turbidity units
O	organic chemical (parameter type)
OG	operational guidance value
P	pesticide (parameter type)
T	treatment-related (parameter type)
TCU	total colour units