
APPENDIX 8

Monitoring Data from North Tributary

APPENDIX 8: MONITORING DATA FROM NORTH TRIBUTARY

A8.1 Additional Monitoring of North Tributary

Additional studies have been completed in 2020 on the North Tributary. Flow gauging and sixteen water chemistry samples were collected on eight occasions from March 16 to December 2, 2020. The samples from the fall of 2020 were collected at locations both upstream and downstream of Denney Drive because the stormwater outfall had been installed at the road culvert.

The observed chemistry is summarized in Table A8.1 showing that total phosphorus levels in the North Tributary were higher than 0.02 mg/L in ten of the sixteen samples, and above 0.03mg/L in four of the sixteen samples. The Nottawasaga River and the North Tributary both have average phosphorus concentrations that are higher than the Provincial Water Quality Objectives (PWQO) and therefore are considered a Policy 2 receiver for phosphorus. The observed concentrations of phosphorus are due to the fine-grained nature of the sediments within the watershed, and also the land use practices which include a high proportion of agricultural use.

Table A8.1: Summary of North Tributary Water Chemistry.

North Tributary Chemistry	n	Average	Maximum	Minimum	Standard Deviation
Total Phosphorus (mg/L)	24	0.081	0.68	<0.002	0.18
Ortho-phosphate (mg/L)	21	0.020	0.12	0.004	0.0031
TSS (mg/L)	20	85.2	1010	<3	229.0
Turbidity (NTU)	24	16.1	132	0.8	33.0
TOC (mg/L)	24	11.3	19.0	3.4	3.7
Colour (TCU)	23	32.5	52.0	7.0	11.5
Chloride (mg/L)	24	31.2	58.3	17.1	10.4
Sodium (mg/L)	24	19.0	82.4	8.4	14.2
Nitrate (mg/L)	23	2.4	11.6	<0.05	2.5
Conductivity (umho/cm)	24	602.1	851.0	390.0	127.1
Alkalinity (mg/L)	24	226.4	293.0	138.0	43.4
Calcium (mg/L)	24	95.8	160.0	65.0	22.6

Water levels in the North Tributary have been measured at the Denney Drive box culvert on a 30 minute basis commencing on March 16, 2020 and continuing to November 2021 (excluding winter frozen period). Manual measurements of flow were compiled on nine occasions and utilized to estimate a rating curve for the creek. Water quality samples were collected on an approximately monthly basis during the same period.

The observed flow during this period ranged from 10 to 400L/s, with a mean day flow of 150 L/s. This is comparable to the range of values predicted by the Ontario Flow Assessment Tool (OFAT) which were utilized for the assimilative capacity update, which predicts a $7Q_2$ of 410L/s and a $7Q_{20}$ of 210 L/s, although the OFAT data seems high-biased. Comparison was also made between the manual gauging data in the North Tributary to the Environment Canada flow in the Main Branch at Baxter (Gauge 02ED003), and the ratio is 57 to 74, which suggests that the areal reduction method may be more appropriate (ratio of watershed catchments is 1:68). Flow gauging is continuing in the North Tributary, however, the statistical evaluation of the flow conditions requires a longer data period for confirmation.

Previously, there had been no information regarding the water quality of the North Tributary. Water quality samples were collected on eight occasions between March and December 2020. Total phosphorus results fell within the range of <0.002 to 0.042mg/L with a mean of 0.025 mg/L. The water quality is better than in the Main Branch, which exhibits a long term average phosphorus level of 0.033mg/L. Most of the values from the North Tributary are higher than the PWQO and indicate that the North Tributary would also be considered a Policy 2 water body. This reflects the agricultural and rural land use in the North Tributary watershed, which is approximately 37% of the total area (based on OFAT land use mapping). Notably the agricultural land use covers the subwatershed area that is closest to Baxter. Given the higher water quality observed in the tributary, the more stringent effluent criteria proposed in the ACS update are warranted.

After the stormwater facility outlet was constructed, monthly samples were collected (Sep-Dec) at the upstream and downstream ends of the culvert to determine if the outlet was having an effect on stream water quality. As the stormwater facility is not yet receiving runoff from the subdivision, the differences are small and do not exhibit a pattern as of yet.

Parameter	Units	Sample ID/Date	Sample ID/Date	Sample ID/Date	Sample ID/Date
		SW-1 Mar 16 2020	SW-1 16 2020 Apr	SW-1 May 19 2020	SW-1 16 2020 Jun
Saturation pH (25°C)	-	7.47	7.36	7.23	7.07
pH @25°C	pH Units	7.97	7.98	8.16	8.33
Langelier Index(25°C)	S.I.	0.504	0.624	0.93	1.26
Alkalinity(CaCO3) to pH4.5	mg/L	138	170	197	244
Bicarbonate(as CaCO3)	mg/L	138	170	197	240
Carbonate (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Hydroxide (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Conductivity @25°C	µmho/cm	390	452	472	656
Fluoride	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Chloride	mg/L	17.1	22.9	18.7	35.1
Nitrate (N)	mg/L	1.62	1.31	0.77	2.87
Nitrite (N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Bromide	mg/L	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	23	19	13	31
Calcium	mg/L	67.2	70.1	80.1	98.8
Magnesium	mg/L	9.25	10.1	11.9	14.5
Sodium	mg/L	8.4	12.1	12.7	17.9
Potassium	mg/L	1	1	1.5	1.3
Ammonia (N)-Total	mg/L	< 0.01	< 0.01	0.02	0.03
o-Phosphate (P)	mg/L	0.013	< 0.002	0.01	0.017
Phosphorus-Total	mg/L	0.036	0.014	0.026	0.035
Silica	mg/L	8.58	8.54	9.89	10.8
Total Organic Carbon	mg/L	9.1	19	14	10.3
Colour	TCU		32	52	28
Turbidity	NTU	5.9	2.4	7.9	2.1
Aluminum	mg/L		0.04	0.09	0.06
Antimony	mg/L	0.0003	0.0003	< 0.0001	< 0.0001
Arsenic	mg/L	0.0004	0.0003	0.0004	0.0009
Barium	mg/L	0.034	0.033	0.057	0.042
Boron	mg/L	0.018	0.015	0.015	0.029
Cadmium	mg/L	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	< 0.001	0.001	< 0.001	< 0.001
Copper	mg/L	0.0009	0.0013	0.001	0.0005
Iron	mg/L	0.481	0.159	0.329	0.181
Lead	mg/L	0.00023	0.00005	0.00014	0.00005
Manganese	mg/L	0.051	0.068	0.085	0.089
Mercury					
Molybdenum	mg/L	0.0003	0.0004	0.0007	0.0008
Nickel	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Silver	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Strontium	mg/L	0.127	0.142	0.195	0.207
Thallium	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.009	< 0.005	< 0.005	< 0.005
Uranium	mg/L	0.00061	0.00085	0.00098	0.00107
Vanadium	mg/L	0.0006	0.0003	0.0005	0.0006
Zinc	mg/L	0.005	0.01	0.009	0.011
TDS(ion sum calc.)	mg/L	209	238	256	345
Hardness (as CaCO3)	mg/L	206	199	249	325
% Difference	%	8.55	3.72	7.29	1.78
BOD(5 day)	mg/L	< 3	< 3	< 3	< 3
Total Kjeldahl Nitrogen	mg/L	0.6	0.5	0.8	0.8
COD	mg/L	30	33	36	20
Total Suspended Solids	mg/L	110	6	16	< 3
Anion Sum	meq/L	3.82	4.54	4.79	6.71
Cation Sum	meq/L	4.53	4.89	5.55	6.95
Ion Ratio	AS/CS	0.842	0.928	0.864	0.965
Conductivity (calc.)	µmho/cm	405	454	491	638
Sodium Adsorption Ratio	-	0.255	0.358	0.331	0.445
TDS(calc.)/EC(actual)	-	0.535	0.526	0.543	0.526

		16-094 - North Trib Lab Analytical Results			
Parameter	Units	Sample ID/Date	Sample ID/Date	Sample ID/Date	Sample ID/Date
		Upstream - Sep 10 2020	Downstream - Sep 10 2020	Upstream - Oct 2 2020	Downstream - Oct 2 2020
Saturation pH (25°C)	-	6.92	7.00	6.99	7.03
pH @25°C	pH Units	8.14	8.22	8.29	8.3
Langelier Index(25°C)	S.I.	1.22	1.22	1.3	1.27
Alkalinity(CaCO3) to pH4.5	mg/L	259	250	257	260
Bicarbonate(as CaCO3)	mg/L	259	250	257	260
Carbonate (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Hydroxide (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Conductivity @25°C	µmho/cm	834	678	688	799
Fluoride	mg/L	< 0.1	< 0.1	< 0.1	0.2
Chloride	mg/L	58.3	36.2	42.1	52.4
Nitrate (N)	mg/L	7.72	2.92	0.17	< 0.05
Nitrite (N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Bromide	mg/L	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	59	33	31	55
Calcium	mg/L	136	113	112	104
Magnesium	mg/L	18.2	16.6	16.9	15.8
Sodium	mg/L	24.9	20.4	25.4	23.4
Potassium	mg/L	1.4	1.8	2.7	2.3
Ammonia (N)-Total	mg/L	0.02	0.02	< 0.01	< 0.01
o-Phosphate (P)	mg/L	0.008	0.014	0.007	0.01
Phosphorus-Total	mg/L	0.024	0.025	0.01	0.019
Silica	mg/L	14.3	14.9	14	13.1
Total Organic Carbon	mg/L	8.1	12.6	5	8.6
Colour	TCU	19	35	32	27
Turbidity	NTU	13.7	1.3	0.8	22.6
Aluminum	mg/L			0.07	0.07
Antimony	mg/L	0.0002	0.0002	0.0003	0.0003
Arsenic	mg/L	0.0012	0.0001	0.0004	0.0007
Barium	mg/L	0.043	0.049	0.041	0.04
Boron	mg/L	0.037	0.039	0.031	0.031
Cadmium	mg/L	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	0.001	< 0.001	< 0.001
Copper	mg/L	0.0009	0.0145	0.001	0.0012
Iron	mg/L	0.309	0.125	0.016	0.125
Lead	mg/L	0.00014	0.00022	0.00012	0.00011
Manganese	mg/L	0.055	0.055	0.009	0.03
Mercury					
Molybdenum	mg/L	0.0008	< 0.0001	0.0005	0.0008
Nickel	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Silver	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Strontium	mg/L	0.263	0.226	0.233	0.214
Thallium	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	< 0.00005	0.00018	0.00151	0.00114
Vanadium	mg/L	< 0.0001	0.0004	0.0004	0.0004
Zinc	mg/L	0.092	0.017	< 0.005	0.011
TDS(ion sum calc.)	mg/L	454	371	384	409
Hardness (as CaCO3)	mg/L	415	351	349	325
% Difference	%	4.52	7.04	7.78	1.65
BOD(5 day)	mg/L	< 3	< 3	< 3	< 3
Total Kjeldahl Nitrogen	mg/L	0.7	0.7	0.4	0.6
COD	mg/L	< 5	24	13	22
Total Suspended Solids	mg/L	27	< 3	3	3
Anion Sum	meq/L	8.61	6.9	6.98	7.83
Cation Sum	meq/L	9.42	7.95	8.15	7.57
Ion Ratio	AS/CS	0.913	0.868	0.856	1.03
Conductivity (calc.)	µmho/cm	826	692	717	736
Sodium Adsorption Ratio	-	0.532	0.474	0.591	0.565
TDS(calc.)/EC(actual)	-	0.544	0.547	0.558	0.512

Parameter	Units	Sample ID/Date	Sample ID/Date	Sample ID/Date	Sample ID/Date
		Upstream - Nov 11 2020	Downstream - Nov 11 2020	Upstream - Dec 2, 2020	Downstream - Dec 2, 2020
Saturation pH (25°C)	-	7.03	7.02	7.25	7.20
pH @25°C	pH Units	8.16	8.24	8.0	8.0
Langelier Index(25°C)	S.I.	1.13	1.22	0.75	0.83
Alkalinity(CaCO3) to pH4.5	mg/L	260	257	198	200
Bicarbonate(as CaCO3)	mg/L	260	257	198	200
Carbonate (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Hydroxide (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Conductivity @25°C	µmho/cm	636	676	545	542
Fluoride	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Chloride	mg/L	31.7	35	29	28.7
Nitrate (N)	mg/L	1.31	2.76	1.84	1.84
Nitrite (N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Bromide	mg/L	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	21	31	26	26
Calcium	mg/L	101	105	78.6	87.2
Magnesium	mg/L	14.9	15.3	13.4	14.3
Sodium	mg/L	17.5	17.6	16	17.2
Potassium	mg/L	1.8	1.7	2	2.1
Ammonia (N)-Total	mg/L	< 0.01	< 0.01	0.01	0.01
o-Phosphate (P)	mg/L	< 0.002	< 0.002	0.01	0.011
Phosphorus-Total	mg/L	0.017	0.028	0.017	0.014
Silica	mg/L	12.6	12.5	10.1	10.8
Total Organic Carbon	mg/L	10.7	10	12.5	12.1
Colour	TCU	35	32	38	40
Turbidity	NTU	0.8	3.1	4.8	3.2
Aluminum	mg/L				
Antimony	mg/L	0.0001	< 0.0001	0.0002	0.0002
Arsenic	mg/L	0.0005	0.0005	0.0004	0.0003
Barium	mg/L	0.048	0.046	0.039	0.043
Boron	mg/L	0.021	0.022	0.022	0.023
Cadmium	mg/L	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	0.001	0.001	< 0.001
Copper	mg/L	0.0005	0.0006	0.0014	0.001
Iron	mg/L	0.099	0.106	0.21	0.206
Lead	mg/L	< 0.00002	0.00007	0.00014	0.00015
Manganese	mg/L	0.029	0.029	0.034	0.032
Mercury					
Molybdenum	mg/L	0.0008	0.0007	0.0005	0.0004
Nickel	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Silver	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Strontium	mg/L	0.203	0.221	0.171	0.236
Thallium	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	0.00117	0.00135	0.00127	0.00098
Vanadium	mg/L	0.0003	0.0004	0.0004	0.0004
Zinc	mg/L	0.006	0.014	0.012	0.008
TDS(ion sum calc.)	mg/L	344	360	284	295
Hardness (as CaCO3)	mg/L	314	325	252	277
% Difference	%	3.32	2.44	2.97	7.47
BOD(5 day)	mg/L	< 3	< 3	< 3	< 3
Total Kjeldahl Nitrogen	mg/L	0.5	0.7	0.7	0.7
COD	mg/L	22	22	26	25
Total Suspended Solids	mg/L	< 3	10	15	7
Anion Sum	meq/L	6.63	6.97	5.45	5.46
Cation Sum	meq/L	7.08	7.31	5.78	6.34
Ion Ratio	AS/CS				
Conductivity (calc.)	µmho/cm				
Sodium Adsorption Ratio	-				
TDS(calc.)/EC(actual)	-	0.541	0.532	0.521	0.545

Parameter	Units	Sample ID/Date	Sample ID/Date	Sample ID/Date	Sample ID/Date
		Upstream - Jan 20 2021	Downstream - Jan 20 2021	Upstream - Feb 12 2021	Downstream - Feb 12 2021
Saturation pH (25°C)	-	7.14	7.13	7.09	7.08
pH @25°C	pH Units	8.1	8.1	8.02	7.95
Langelier Index(25°C)	S.I.	0.963	0.974	0.926	0.866
Alkalinity(CaCO3) to pH4.5	mg/L	216	218	242	242
Bicarbonate(as CaCO3)	mg/L	216	218	242	242
Carbonate (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Hydroxide (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Conductivity @25°C	µmho/cm	573	576	612	617
Fluoride	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Chloride	mg/L	29.2	29.2	27.7	27.9
Nitrate (N)	mg/L	1.81	1.83	1.84	1.92
Nitrite (N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Bromide	mg/L	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	26	26	24	25
Calcium	mg/L	93.5	95.3	92.2	94.2
Magnesium	mg/L	13.9	14.2	14.6	15.1
Sodium	mg/L	14.5	14.8	15.4	16.3
Potassium	mg/L	1.2	1.2	1.3	1.4
Ammonia (N)-Total	mg/L	0.02	0.02	0.04	0.04
o-Phosphate (P)	mg/L	0.01	0.006	0.006	0.006
Phosphorus-Total	mg/L	0.042	0.027	0.025	0.037
Silica	mg/L	10.3	10.6	12.5	12.9
Total Organic Carbon	mg/L	11.3	11.2	11.1	11.2
Colour	TCU	26	26	23	22
Turbidity	NTU	5.5	4.4	2.6	3
Aluminum	mg/L	0.13	0.1		
Antimony	mg/L	0.0003	0.0003	0.0002	0.0001
Arsenic	mg/L	0.0003	0.0003	0.0004	0.0004
Barium	mg/L	0.039	0.04	0.041	0.042
Boron	mg/L	0.019	0.02	0.015	0.016
Cadmium	mg/L	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	< 0.001	< 0.001	< 0.001
Copper	mg/L	0.0005	0.0006	0.0005	0.0006
Iron	mg/L	0.301	0.268	0.155	0.196
Lead	mg/L	0.00011	0.0001	0.00004	0.00011
Manganese	mg/L	0.065	0.061	0.084	0.077
Mercury				< 0.00002	< 0.00002
Molybdenum	mg/L	0.0003	0.0003	0.0003	0.0004
Nickel	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Silver	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Strontium	mg/L	0.19	0.195	0.19	0.247
Thallium	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Uranium	mg/L	0.00116	0.00118	0.00103	0.00102
Vanadium	mg/L	0.0003	0.0003	0.0003	0.0003
Zinc	mg/L	0.01	0.009	0.007	0.007
TDS(ion sum calc.)	mg/L	309	312	321	325
Hardness (as CaCO3)	mg/L	291	297	290	297
% Difference	%	5.46	6.2	2.07	3.28
BOD(5 day)	mg/L	< 3	< 3	< 3	< 3
Total Kjeldahl Nitrogen	mg/L	0.6	0.6	0.6	0.7
COD	mg/L	18	22	23	26
Total Suspended Solids	mg/L	37	15	3	17
Anion Sum	meq/L	5.82	5.84	6.25	6.28
Cation Sum	meq/L	6.49	6.62	6.52	6.7
Ion Ratio	AS/CS	0.897	0.883	0.959	0.936
Conductivity (calc.)	µmho/cm	582	589	596	606
Sodium Adsorption Ratio	-	0.37	0.374	0.392	0.412
TDS(calc.)/EC(actual)	-	0.539	0.541	0.524	0.527

Parameter	Units	Sample ID/Date	Sample ID/Date	Sample ID/Date	Sample ID/Date
		Upstream - Mar 26 2021	Downstream - Mar 26 2021	Upstream - May 1 2021	Downstream - May 1 2021
Saturation pH (25°C)	-	7.41	7.46	7.2	7.25
pH @25°C	pH Units	7.98	8	8.12	8.13
Langelier Index(25°C)	S.I.	0.569	0.54	0.923	0.88
Alkalinity(CaCO3) to pH4.5	mg/L	146	144	227	225
Bicarbonate(as CaCO3)	mg/L	146	144	227	225
Carbonate (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Hydroxide (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Conductivity @25°C	µmho/cm	415	410	507	518
Fluoride	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Chloride	mg/L	23.6	23.6	21.3	21.8
Nitrate (N)	mg/L	0.84	0.79	0.9	1.27
Nitrite (N)	mg/L	0.08	0.08	< 0.05	< 0.05
Bromide	mg/L	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	15	14	14	17
Calcium	mg/L	73.7	65	77.5	68.2
Magnesium	mg/L	12	9.52	11.5	10.2
Sodium	mg/L	82.4	13.5	10.6	9.4
Potassium	mg/L	4.6	3.5	1.2	1.1
Ammonia (N)-Total	mg/L	0.1	0.09	0.01	< 0.01
o-Phosphate (P)	mg/L	0.11	0.116	0.004	0.004
Phosphorus-Total	mg/L	0.642	0.679	0.023	0.021
Silica	mg/L	11.4	10.5	8.71	7.67
Total Organic Carbon	mg/L	14.1	13.9	13.9	13.7
Colour	TCU	48	46	42	42
Turbidity	NTU	107	132	3	2.2
Aluminum	mg/L				
Antimony	mg/L	0.0003	0.0004	0.0002	0.0003
Arsenic	mg/L	0.0018	0.0017	0.0004	0.0004
Barium	mg/L	0.054	0.05	0.034	0.03
Boron	mg/L	0.03	0.021	0.016	0.015
Cadmium	mg/L	0.000066	0.000066	< 0.000015	< 0.000015
Chromium	mg/L	0.003	0.003	0.002	0.002
Copper	mg/L	0.005	0.0048	0.0007	0.0005
Iron	mg/L	3.24	2.89	0.201	0.176
Lead	mg/L	0.0024	0.0022	0.00005	0.00006
Manganese	mg/L	0.276	0.256	0.05	0.044
Mercury					
Molybdenum	mg/L	0.0006	0.0005	0.0005	0.0005
Nickel	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Silver	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Strontium	mg/L	0.464	0.145	0.165	0.15
Thallium	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.069	0.064	< 0.005	< 0.005
Uranium	mg/L	0.00092	0.00084	0.00081	0.00092
Vanadium	mg/L	0.004	0.0036	0.0003	0.0003
Zinc	mg/L	0.03	0.038	0.006	0.022
TDS(ion sum calc.)	mg/L	302	219	273	262
Hardness (as CaCO3)	mg/L	233	202	241	212
% Difference	%	36.8	11	1.66	8.37
BOD(5 day)	mg/L	4.0	4.0	< 3	< 3
Total Kjeldahl Nitrogen	mg/L	1.6	1.7	0.7	0.7
COD	mg/L	53	53	34.0	35.0
Total Suspended Solids	mg/L	1010	315	6	5
Anion Sum	meq/L	3.95	3.91	5.49	5.54
Cation Sum	meq/L	8.55	4.87	5.31	4.69
Ion Ratio	AS/CS	0.462	0.802	1.03	1.18
Conductivity (calc.)	µmho/cm	587	422	507	479
Sodium Adsorption Ratio	-	2.35	0.413	0.296	0.28
TDS(calc.)/EC(actual)	-	0.728	0.535	0.538	0.507

Parameter	Units	Sample ID/Date	Sample ID/Date	Sample ID/Date	Sample ID/Date
		Upstream - June 23 2021	Downstream - June 23 2021	Upstream - July 30 2021	Downstream - July 30 2021
Saturation pH (25°C)	-	6.99	6.86	6.98	6.95
pH @25°C	pH Units	8.25	8.17	8.28	8.20
Langelier Index(25°C)	S.I.	1.26	1.31	1.3	1.25
Alkalinity(CaCO3) to pH4.5	mg/L	247	251	293	293
Bicarbonate(as CaCO3)	mg/L	247	251	293	293
Carbonate (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Hydroxide (as CaCO3)	mg/L	< 5	< 5	< 5	< 5
Conductivity @25°C	µmho/cm	681	851	663	660
Fluoride	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Chloride	mg/L	32.6	49.2	26	28.6
Nitrate (N)	mg/L	4.65	11.6	1.55	1.52
Nitrite (N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Bromide	mg/L	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	55	95	25	25
Calcium	mg/L	117	160	100	109
Magnesium	mg/L	16.4	23.1	14.2	15.7
Sodium	mg/L	18.1	16	15.2	16.6
Potassium	mg/L	2	1.3	1.4	1.6
Ammonia (N)-Total	mg/L	0.02	0.01	0.04	0.04
o-Phosphate (P)	mg/L	0.01	0.009	0.023	0.02
Phosphorus-Total	mg/L	0.076	0.021	0.03	0.05
Silica	mg/L	11.7	12.5	13.9	15.2
Total Organic Carbon	mg/L	4.3	3.4	16	16.1
Colour	TCU	11	7	41	43
Turbidity	NTU	26.7	28.4	1.3	1.6
Aluminum	mg/L				
Antimony	mg/L	0.0003	0.0003	0.0003	0.0004
Arsenic	mg/L	0.0011	0.0005	0.0008	0.0009
Barium	mg/L	0.054	0.043	0.042	0.048
Boron	mg/L	0.05	0.058	0.038	0.04
Cadmium	mg/L	0.000016	< 0.000015	< 0.000015	< 0.000015
Chromium	mg/L	0.001	0.001	0.002	0.001
Copper	mg/L	0.001	0.0012	0.0006	0.0008
Iron	mg/L	0.827	0.161	0.15	0.343
Lead	mg/L	0.00038	0.00048	0.00005	0.0002
Manganese	mg/L	0.435	0.05	0.042	0.068
Mercury					
Molybdenum	mg/L	0.0005	0.0003	0.0012	0.0011
Nickel	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Selenium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Silver	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Strontium	mg/L	0.281	0.384	0.228	0.293
Thallium	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.012	< 0.005	< 0.005	0.007
Uranium	mg/L	0.00145	0.00601	0.00088	0.00094
Vanadium	mg/L	0.001	0.0005	0.0005	0.0007
Zinc	mg/L	0.016	0.142	0.027	0.018
TDS(ion sum calc.)	mg/L	391	495	358	373
Hardness (as CaCO3)	mg/L	360	495	309	336
% Difference	%	4.86	7.16	2.36	1.35
BOD(5 day)	mg/L	< 3	< 3	< 3	< 3
Total Kjeldahl Nitrogen	mg/L	0.7	0.4	0.8	0.9
COD	mg/L	12	< 5	35	35
Total Suspended Solids	mg/L	82	9	< 3	7
Anion Sum	meq/L	7.34	9.21	7.21	7.3
Cation Sum	meq/L	8.09	10.6	6.88	7.5
Ion Ratio	AS/CS			1.05	0.973
Conductivity (calc.)	µmho/cm			648	681
Sodium Adsorption Ratio	-			0.376	0.394
TDS(calc.)/EC(actual)	-	0.574	0.582	0.540	0.565