

**1977**

**CONESTOGO RESERVOIR**  
**A Preliminary Water Quality Survey**

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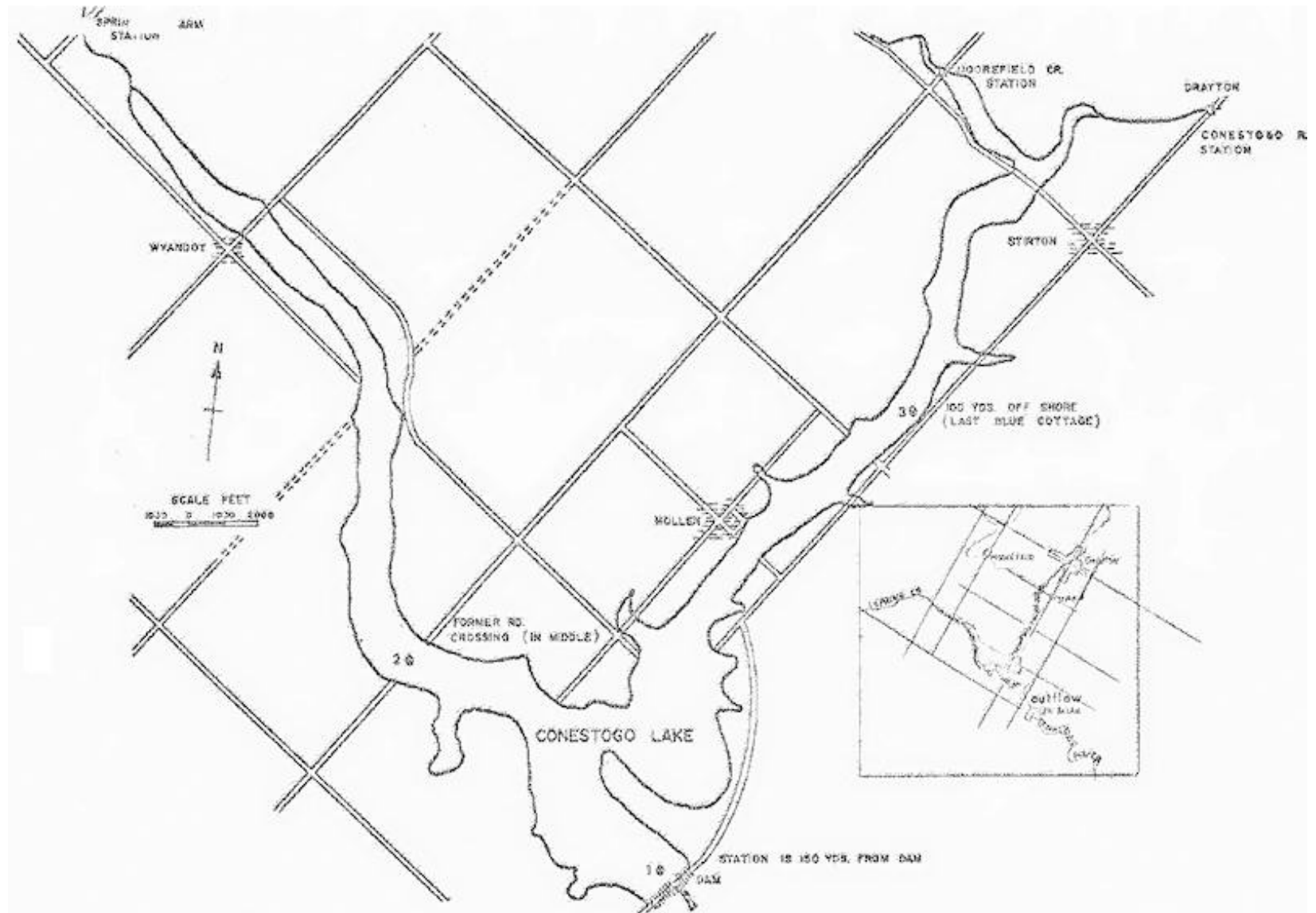
## **A. Background Information on Conestogo Reservoir**

The Conestogo Watershed originates in two main branches, one being approximately 10 miles north of Arthur and the other approximately 10 miles northwest of Arthur. It enters the Grand River near the village of Conestogo approximately 25 miles north of Galt. The river traverses in a southwest direction for half of its 51 mile length and then southeast to the confluence with the Grand River. Its fall in elevation is 550 feet resulting in an average gradient of 10.8 feet per mile. The Conestogo watershed or drainage area is 317.5 square miles, approximately 31 miles long and varies between 4 and 13 miles in width.

The Conestogo River is subject to flash floods and erratic to little summer flow. To provide a means of reducing flood frequency and increasing river flows during periods of low precipitation and runoff, the Conestogo Dam and reservoir was constructed and completed in 1958 slightly upstream of Glen Allan and 30 miles upstream of Galt.

The dam is an earthfill gravity type structure with a central concrete section. The overall length is 1790 feet with the top of the dam being 80 feet above the streambed. The control structure consists of 4 low level sluice gates each 15 feet wide by 20 feet deep, capable of discharging 55,000 c.f.s., and one 48" regulating valve. The base of the sluice gates or the sill level is at 1225' ASL or 63 feet below maximum controlled reservoir level. The 48" regulating valve is located two feet below the sill level.

The drainage area above the dam is 220 square miles and results in a "Y" shaped reservoir with each arm extending six miles in a northwest and northeast direction. At maximum water level, 1290' ASL, the reservoir covers an area of 1,816 acres, a storage of 45,060 acre-feet with a maximum depth of 74 feet.



**MAP I:** Conestogo Reservoir - Sampling Stations

## **B. Summary and Recommendations**

Water Quality of Conestoga Lake is certainly mesotrophic (mid-range in lake eutrophication) and bordering on a eutrophic state. This study revealed that water quality below the dam at Glen Allan was generally better than the inflowing waters. Average values throughout the sampling period indicate that:

1. Dissolved Oxygen is higher below than above
2. Water Temperature is cooler below than above
3. BOD<sub>5</sub> is lower below than above
4. Alkalinity is lower below than above
5. Total Hardness is lower below than above
6. Calcium Hardness is lower below than above.
7. pH is the same below as above.
8. Nitrates are lower below than above.
9. Phosphates are lower below than above
10. Sulphates are lower below than above.
11. Iron is slightly higher below than above.

These parameters coupled with the fact that flows below the dam were relatively constant throughout the summer at an average of 97.5 c.f.s. compared to inflowing average values at Drayton of 19.3 c.f.s. at Moorefield of 12.9 c.f.s. and at Spring Creek with virtually no flow illustrate that Conestoga Reservoir Improves water quality in this regard downstream.

It must also be understood that this water quality below the dam is not great (BOD<sub>5</sub>: 1.75 mg/L ; NO<sub>3</sub> 1.13 mg/L; PO<sub>4</sub> 0.2 mg/L) and is attributable to the mesotrophic water quality within the reservoir, which is impaired partially because of poor inflowing water (tremendous amount of agricultural land drained) and partially because of use of the lake. Increased use of this reservoir will certainly contribute to deterioration of reservoir water quality and therefore affect downstream water quality.

It is recommended that monthly or bimonthly chemical monitoring be continued to assess changes within the reservoir as well as inflowing and outflowing waters. Collections for nutrients should also be made during reservoir filling in an effort to assess quantities of nutrient entering. This may allow us to determine more effectively nutrient contribution within the reservoir.

## C. Conestogo Reservoir Water Quality Analysis

### Introduction

Conestoga Reservoir was one of four reservoirs surveyed during late Spring, Summer and early Fall, of 1977. The purpose of the study was basically twofold, to determine the effects of a reservoir on downstream water quality, and to establish reservoir water quality. Stations were established on the inflows, the outflow and 3 surface and bottom stations within the reservoir. Samples were collected weekly from the surface and one metre from the substrate employing a Kemmerer bottle and taken to the lab for analysis. Dissolved Oxygen and Water Temperature were obtained employing a YSI-Dissolved Oxygen metre, as were Dissolved Oxygen-Water Temperature Profiles. BOD<sub>5</sub> samples were analysed using the YSI BOD probe. All other chemical parameters were measured with the Hach DREL kit. Stream samples were Monitored in the same fashion.

### Station Location (Map I pg. 2)

#### Inflow

Three inflow stations were established, one on the Conestogo River at Drayton, one on Moorefield Creek at Moorefield and one on Spring Creek at the existing gauge Station.

#### Outflow

This station is found in the Village of Glen Allan where a permanent streamflow gauge is present.

#### Reservoir

Conestoga River roughly resembles a "Y" shape-with the arms directed northwest and northeast, the bottom of the "Y" being in a more northerly direction than the two arms. Approximately halfway up each arm a station was established at the deepest point based on soundings across the reservoir. Station two located on the northwest arm vatted in depth from 11 metres at the end of May to 8.25 metres by early August. Station 3 on the northeast arm had a depth ranging from 6.5 metres in May to 3.75 metres by early August. Station one was located approximately 100 metres from the concrete dam structure. Depth at this location varied from 18.25.



- C. i) Inflow
  - a) Drayton, Conestogo River

Dissolved Oxygen during the day proved to be acceptable with the lowest value recorded being 7.2 mg/L. Of all the stations with the exception of bottom Dissolved Oxygen in the reservoir, this location revealed the lowest average Dissolved Oxygen. Water Temperature varied from Spring to Fall from 14 to 25°C, the average over the period being 19.3°C. The warmest Water Temperature of 25°C was recorded on the same day Air Temperature was the warmest (29°C). There is a very direct relation between Water Temperature and Air Temperature at this location because the flow is very slow (June 6 to August 3 average flow is 9.8 c.f.s.) and the river is not shaded to any great degree at this point. BOD<sub>5</sub> indicated slight enrichment, the average values being slightly greater than that of the outflow (1.9 mg/L vs. 1.75 mg/L).

Faecal Coliforms appear to be a problem since on 10 of 16 times sampled, Faecal Coliform values exceeded established criteria. Total Coliforms did not exceed at all. Alkalinity, Total Hardness and Calcium Hardness indicate that the water has excellent buffering capacity and is very hard. Comparison of average values show that alkalinity, Total Hardness and Calcium Hardness are higher at inflows and lower in the outflow. pH values are within an acceptable range but generally at the higher end of the scale.

It is recommended that in order to avoid aquatic nuisance plant problems, phosphate and nitrate values must be less than 0.01 mg/L and 0.3 mg/L respectively. The average values at Drayton exceed these values. There is not an appreciable buildup of nutrients, in Conestogo Reservoir as there is at Belwood.

Sulfates present no problem and nor does iron with the exception of one period of time. Between July 11 and July 25, iron exceeded 0.3 mg/L. Flow throughout the summer was very poor and not until a rainy August did flows really exceed 10 c.f.s.

AREA: DRAYTON

STATION:

DEPTH:

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	7.5	18			0/3	200	215	115	7.6	0.4	0.05	29	0.15	16.5	1	
June 6	7.7	16	2.05		0/500	225	170	80	8.0	1.0	0.08	26	0.05	12	2	
June 13	7.8	17.5	2.5		20/22	220			8.3	0.4	0.05	24	0.10	19	1	
June 20	7.5	19	2.55		80/78	240			8.5	0.8	0.10	22	0	21.5	2	
June 27	7.2	22.5	2.5		0/168	210			8.2	0.3	0.08	21	0.20	26.5	1	
July 4	7.8	23	1.45		72/150	195	190	100	8.5	2.2	0.05	26	0.15	27	1	
July 11	8.1	20.5	2.0		40/180	240			8.1	4.4	0.32	34	0.35	23.5	1	
July 18	7.2	25	2.25		12/96	225			8.4	1.0	0.10	25	0.30	29	1	
July 25	8.4	21.5	2.55		8/132	225			8.3	0.4	0.31	25	0.33	20.5	1	
Aug. 3	7.7		1.35		32/68	200			7.9	0.6	0.10	23	0.20	21	2	
Aug. 8	7.3	22	1.15		2/400	200	180	140	7.8	0.6	0.20	29	0.20	22	2	
Aug. 15	7.4	18.5	1.8		0/300	250			8.1	1.4	0.80	34	0.40	22	1	
Aug. 22	9.0	13	1.6		12/240	260			8.2	1.1	0.90	29	0.10	17	1	
Aug. 29	7.2	22	1.35		32/144	260			7.7	0.4	0.40	27	0.05	22	2	
Labour Day																
Sept. 12	11.0	14	1.0		20/72	260	220	145	8.0	1.3	0.35	21	0.15	16	2	
Sept. 21	10.5	15	2.4		0/200	295			8.0	0.4	1.25	30	0.25	12	3	
MAX.	11.0	25	2.55		72/500	295	220	145	8.5	4.4	1.25	34	0.35			
AVE.	8.08	19.3	1.9			231.6	195	116	8.1	1.04	0.32	26.8	0.186			
MIN.	7.2	14	1.0		0/3	195	170	80	7.6	0.3	0.05	21	0			
# SAMPLES	16	15	15		16	16	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms Faecal Coliforms	PO <sub>4</sub>	Phosphate				
ALK	Alkalinity	SO <sub>4</sub>	Sulfate				
		Fe	Iron				

b) Moorefield

This inflow indicates a greater degree of pollution in comparison to the main Conestogo River inflow. Dissolved Oxygen fluctuates from 12.3 mg/L to 5.9 mg/L which may indicate a great diurnal variation. BOD<sub>5</sub> exceeds 2.0 mg/L on 13 of 15 times examined with a maximum of 6.15 mg/L and minimum of 1.75 mg/L. Maximum Water Temperature was 26°C which occurred when the Air Temperature was 33°C, highest recorded all summer. Flows were not great all summer with an average of 13 c.f.s. and the higher flows beginning in August. The water is harder here than in the Conestoga but generally Alkalinity, Total Hardness, Calcium Hardness and pH indicate similar conditions as in the main river. Sulfates and Iron Values also present little to worry about.

AREA: MOOREFIELD

STATION:

DEPTH:

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	10.5	16			14/26	215	240	120	8.4	1.8	0.05	24	0.10	17.5	1	
June 6	7.7	15	2.55		0/500	200	230	80	7.6	0.9	0.06	22	0.10	10	2	
June 13	10.9	17.5	2.9		70/84	220			7.7	1.0	0.08	24	0.05	20	1	
June 20	7.5	16	2.7		1000/100?	210			8.2	1.0	0.05	24	0	16.5	2	
June 21	8.2	23	2.35		500/400	200			8.2	0.8	0.03	21	0.20	28.5	1	
July 4	9.6	23.5	2.0		80/300	200	230	110	8.5	1.4	0.01	21	0.15	28.5	1	
July 11	8.1	21	1.75		88/400	230			8.4	3.0	0.28	22	0.15	22.5	1	
July 18	9.5	26	4.6		TNC/TNC	220			8.4	1.1	0.10	21	0.15	33	1	
July 25	10.1	21.5	2.7		TNC/TNC	200			8.1	0.9	0.25	21	0.18	21.5	1	
Aug. 3	11.5		6.15		TNC/300	180			8.5	1.4	0.10	24	0.15	21	2	
Aug. 8	7.3	22.0	1.25		0/300	220	240	145	8.4	1.3	0.30	24	0.10	22	2	
Aug. 15	11.2	18.5	2.7		200/TNC	225			8.2	0.9	0.28	23	0.10	21.5	1	
Aug. 22	6.5	15	2.3		TNC/TNC	250			7.8	2.1	0.70	23	0.10	18	1	
Aug. 29	5.9	22.5	2.2		TNC/400	250			7.8	1.4	0.32	23	0	21.5	2	
Labour Day																
Sept. 12	12.3	14	1.45		TNC/TNC	255	230	165	7.8	0.8	0.28	24	0.15	36	2	
Sept. 21	9.6	14	2.6		TNC/400	290			8.4	0.75	1.05	24	0.20	12	3	
MAX.	12.3	26	6.15		TNC/TNC	290	240	165	8.4	1.8	1.05	24	0.20			
AVE.	9.19	19.2	2.68			222.8	234	124	8.15	1.32	0.25	22.8	0.12			
MIN.	5.9	14	1.75		0/100	180	230	10	7.6	0.75	0.01	21	0			
# SAMPLES	16	15	15			16	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				

c) Spring Creek

This stream could be considered a cold water stream. Only two times did the Water Temperature exceed 20°C. However, according to the flow records, it would have to be -considered intermittent since from about June to mid-August the records show that there was little to no flow. The impact on the reservoir is certainly not significant so a brief discussion of the parameters will Dissolved Oxygen, Water Temperature and BOD<sub>5</sub> are all acceptable. Wide variations in both Total and Faecal Coliforms values were recorded. the Alkalinity is high and the water is considered to be hard. pH falls within the acceptable range Phosphates and Nitrates are high but because of the flow other than in the Spring the nutrient input is not great. Sulfates and Iron are not of concern.

AREA, SPRING CREEK

STATION:

DEPTH:

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	8.5	15			7/9	255	210	155	7.4	1.0	0.22	17	0.20	19	1	
June 6	6.9	13	3.9		250/400	200	195	130	7.3	0.3	0.19	15	0.18	10.5	2	
June 13	9.1	16	2.15		62/28	250			7.8	1.6	0.17	17	0.15	19	1	
June 20	8.25	11.5	1.55		200/106	235			8.2	1.3	0.17	22	0.05	19	2	
June 27	8.4	20	2.4		20/220	220			7.7	0.6	0.18	17	0.30	27	1	
July 4	10.2	23	1.15		250/96	220	215	90	7.8	1.2	0.18	15	0.05	28	1	
July 11	9.1	17.5	1.65		80/186	215			8.4	2.3	0.21	15	0.15	21	1	
July 18	9.5	23.5	1.55		52/90	210			8.1	1.0	0.11	12	0.08	30.5	1	
July 25	7.7	19.5	1.8		320/190	200			8.0	1.3	0.20	15	0.10	19	1	
Aug. 3	8.5		0.45		18/250	180			7.9	1.3	0.05	16	0.10	21	2	
Aug. 8	6.6	21.5	0.6		0/400	195	220	200	8.2	1.3	0.13	13	0.03	22	3	
Aug. 15	9.0	16.0	1.45		10/400	210			7.8	1.4	0.30	18	0	23	1	
Aug. 22	7.8	15.0	1.95		TNC/TNC	255			7.7	1.6	1.0	39	0.10	19	1	
Aug. 21	5.1	19	2.45		TNC/390	280			8.0	1.5	0.72	29	0.05	20.5	2	
Labour Day																
Sept. 12	10.3	11	1.3		80/144	285	240	220	7.8	0.9	0.5	19	0.10	16	2	3
Sept. 21	8.7	14	2.05		400/300	260			7.9	0.75	1.3	24	0.10	12		
MAX.	12.3	26	6.15		TNC/TNC	290	240	165	8.4	1.8	2.05	24	0.20			
AVE.	9.19	19.2	2.68			222.8	234	124	8.15	1.32	0.25	22.8	0.12			
MIN.	5.9	14	1.75		0/100	180	230	80	7.6	0.75	0.01	21	0			
# SAMPLED	16	15	15			16	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms Faecal Coliforms	PO <sub>4</sub>	Phosphate				
ALK	Alkalinity	SO <sub>4</sub>	Sulfate				
		Fe	Iron				

C ii) Outflow at Glen Allan

A comparison of average values between the outflow and inflows reveals that the outflow is of a better quality than the inflows. The following table of averages illustrates this conclusion.

Parameter	Average Values			
	Table# Outflow	Conestogo	Moorefield	Spring Creek
DO (mg/L)	10.3	8.1	9.2	8.4
WT (°C)	17.5	19.4	19.2	17
BOD (mg/L)	1.75	1.9	2.68	1.8
Alk (mg/L)	172	232	223	229
TH (mg/L)	165	195	234	216
CaH (mg/L)	116	116	125	149
pH	8.1	8.1	8.2	7.9
NO <sub>3</sub> (mg/L)	3.13	1.04	1.32	1.21
PO <sub>4</sub> (mg/L)	0.23	0.32	0.25	0.35
SO <sub>4</sub> (mg/L)	17.0	26.8	22.8	18.9
Fe (mg/L)	0.14	0.19	0.12	0.12
Flow (cfs)	97.5 (does not include Sept.)	19.0	13.0	0.4

Based on the parameters measured the river at this point indicates slight to mild organic enrichment.

AREA: GLEN ALLAN STATION: DEPTH:

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	12.3	14			3/0	180	160	130	8.1	1.6	0.15	17	0.05	19	1	
Jane 6	10.0	11	1.45		48/72	175	170	120	7.7	0.3	0.12	19	0.02	9.5	2	
June 13	12.0	14	2.65		44/4	170			8.5	1.5	0.10	16	0.05	13	1	
June 20	10.1	14	2.75		20/24	115			8.2	1.1	0.09	23	0.05	19.5	1	
June 27	10.2	17	2.45		30/43	170			8.3	0.9	0.07	18	0.25	27	1	
July 4	10.9	20	1.45		20/38	175	140	90	8.0	1.4	0.09	17	0.25	28	1	
July 11	9.6	19	1.45		44/46	175			7.8	0.4	0.11	15	0.20	23	2	
July 18	11.2	22	1.30		44/56	180			8.3	1.6	0.14	16	0.20	31	1	
July 25	10.2	20	1.80		72/56	175			8.5	1.4	0.21	16	0.14	19	1	
Aug. 3	8.6		1.55		26/84	175			7.8	1.6	0.15	18	0.15	21	2	
Aug. 8	7.9	21	0.15		40/18	170	170	115	8.0	1.6	0.05	15	0.09	22	3	
Aug. 15	9.1	21	1.55		24/34	170			8.0	1.4	0.25	16	0.10	22.5	1	
Aug. 22	9.4	17	2.20		48/80	140			7.7	1.5	0.80	22	0.40	19	1	
Aug. 23	8.9	19	1.65		2/300	180			7.8	1.3	0.74	22	0.10	22	2	
Labour Day																
Sept. 12	12.3	17	2.45		TNC/200	165	185	125	8.4	0.3	0.25	19	0.05	16	2	
Sept. 21	11.9	17	3.20		150/134	170			8.5	0.2	0.40	21	0.10	12	2	
MAX.	12.3	22	3.20		TNC/300	185	185	130	8.5	1.6	0.80	23	0.05			
AVE.	10.29	17.5	1.75			172	165	116	8.1	1.13	0.23	17	0.14			
MIN.	7.9	11	0.15		2/0	140	140	90	7.7	0.2	0.07	15	0.40			
# SAMPLED	16	15	16			16	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				



c. iii) Reservoir Station #1

The depth at this location varied from 18.25 metres at the end of May to a minimum of 15 metres by mid-September. A thermocline did not really form at all. There is some scratchy evidence that a thermocline was present for a while in mid-summer but was soon dissipated. The greatest temperature difference (from top to bottom) was 6°C which occurred in late spring. After mid-July the differences in water temperature from top to bottom were only about 2°C. As will be shown throughout this section the water column is fairly evenly mixed.

Although anoxic conditions within the bottom water was not proven this summer Dissolved Oxygen values of less than 5.0 mg/L were evident near the bottom from mid-June to mid-August. The average Dissolved Oxygen on the bottom was 4.16 mg/L whereas the surface waters were above 9.0 mg/L. As is shown by the Dissolved Oxygen profile graph #1, more water above 5.0 mg/L Dissolved Oxygen was present than below 5.0 mg/L. Generally the Dissolved Oxygen decline from top to bottom was very gradual (Summer Dissolved Oxygen-Water Temperature profile, Graph #1).

Average BOD<sub>5</sub> values for both top and bottom were not really very bad, but do indicate mild organic enrichment. The values for top and bottom average, maximum, and minimum were 1.62 mg/L, 4.2 mg/L, 0.8 mg/L and 1.79 mg/L, 4.5 mg/L and 0.9 mg/L respectively. As evidence of virtually total mixing both bottom and top BOD<sub>5</sub>'s showed no trend but rather either both were bad, good or the same throughout the summer. Poorest values for both top and bottom appear in late summer and early fall. Early to mid-summer BOD<sub>5</sub> values downstream at Glen Allan are much poorer than the reservoir values, however, the reverse occurs after this period in that downstream BOD<sub>5</sub> values are better than the bottom waters of the reservoir.

Secchi disc values are poorer than those of Belwood showing a maximum of 2.35 metres, minimum of 0.7 metres and an average of 1.29 metres. The clearest water occurred in mid-June and average values were evident throughout the summer. Total Coliform and Faecal Coliform values are acceptable. Alkalinity showed excellent buffering capacity with the bottom waters having a slightly higher alkalinity. The water

is considered to be very hard with the bottom waters slightly harder than the surface waters. Calcium is the largest fraction of the total hardness factor. Bottom waters are more acidic than top, but both top and bottom are much the same pointing out that the waters are well-mixed at this point. The average nitrate value at Glen Allan is slightly less than the bottom average value. This indicates a slight buildup of nitrates within the reservoir since the outflowing average value is less than the average inflowing values. This buildup does not appear to be as drastic as that displayed at Belwood.

There does not appear to be a significant contribution of nitrates from other sources at this point. Phosphates display the same trends as do nitrates, that being less phosphates at Glen Allan than in the reservoir, higher values entering the reservoir than are in the reservoir and an apparent buildup of phosphates in the reservoir. Both these values, nitrates and phosphates are still in excess of permissible values applied by the Ministry of the Environment. In other words there is sufficient nutrient inflowing within the reservoir and outflowing to create algal blooms. Both sulphates and iron are within the accepted range and do not pose a problem to Conestogo Reservoir.

AREA: CONESTOGO LAKE

STATION: #1

DEPTH: TOP

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	9.6	17		1.55	0/2	150	160	110	7.0	1.4	0.08	18	0	18	1	
June 6	13.1	17	1.15	1.75	110/0	165	130	110	8.4	0.7	0.09	17	0	11	3	
June 13	15.0	16.5	1.4	2.35	132/0	170			8.0	1.8	0.13	8	0	18	1	
June 20	8.2	18	0.85	1.15	26/2	165			8.0	1.2	0.10	21	0.10	18	2	
June 27	8.8	21	1.0	1.0	10/0	170			8.2	1.5	0.14	18	0	25	1	
July 4	7.9	20	0.75	1.0	8/0	175	190	120	8.1	1.4	0.12	16	0	26	1	
July 11	8.1	20.5	1.85	1.20	4/0	175			8.0	1.4	0.11	14	0.08	20	2	
July 18	9.5	23.5	0.85	1.30	0/2	170			8.5	1.6	0.10	14	0.05	27	1	
July 25		23.0	0.3	1.30	46/12	175			8.1	1.6	0.12	13	0.02	21	2	
Aug. 3	7.5	21.0	0.55	1.20	10/6	165			8.2	1.5	0.10	17	0.05	21		
Aug. 8	8.3	22.0	0.25	1.25	6/10	165	115	120	8.1	1.5	0.10	18	0.10	22	3	
Aug. 15	8.0	21.0	1.9	1.35	8/10	165			8.2	1.6	0.30	17	0.10	17	1	
Aug. 22	8.6	18.0	2.35	1.0	28/50	165			8.1	1.3	0.30	19	0.05	16	2	
Aug. 29	8.4	20.0	2.7	1.55	46/20	160			8.2	1.4	0.75	20	0.05	22	3	
Labour Day																
Sept. 12	9.0	18.5	4.2	1.0	68/100	165	190	120	8.4	0.6	0.30	21	0.10	16	1	
Sept. 21	7.6	18.0	3.7	0.7	100/54	155			8.4	0.1	0.40	20	0	13.5	3	
MAX.	15.0	23.5	4.2	2.35	132/100	175	190	120	8.5	1.8	0.75	21	0.10			
AVE.	9.2	19.7	1.62	1.29		165.9	181	116	8.12	1.28	0.20	17.9	0.04			
MIN.	7.6	16.5	0.8	0.7	0/0	155	160	110	7.0	0.1	0.08	8	0			
# SAMPLES	15	16	15	16	16	16	5	5	16	16	16	16	16	16		

DO	Dissolved Oxygen	TH	Total Hardness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				

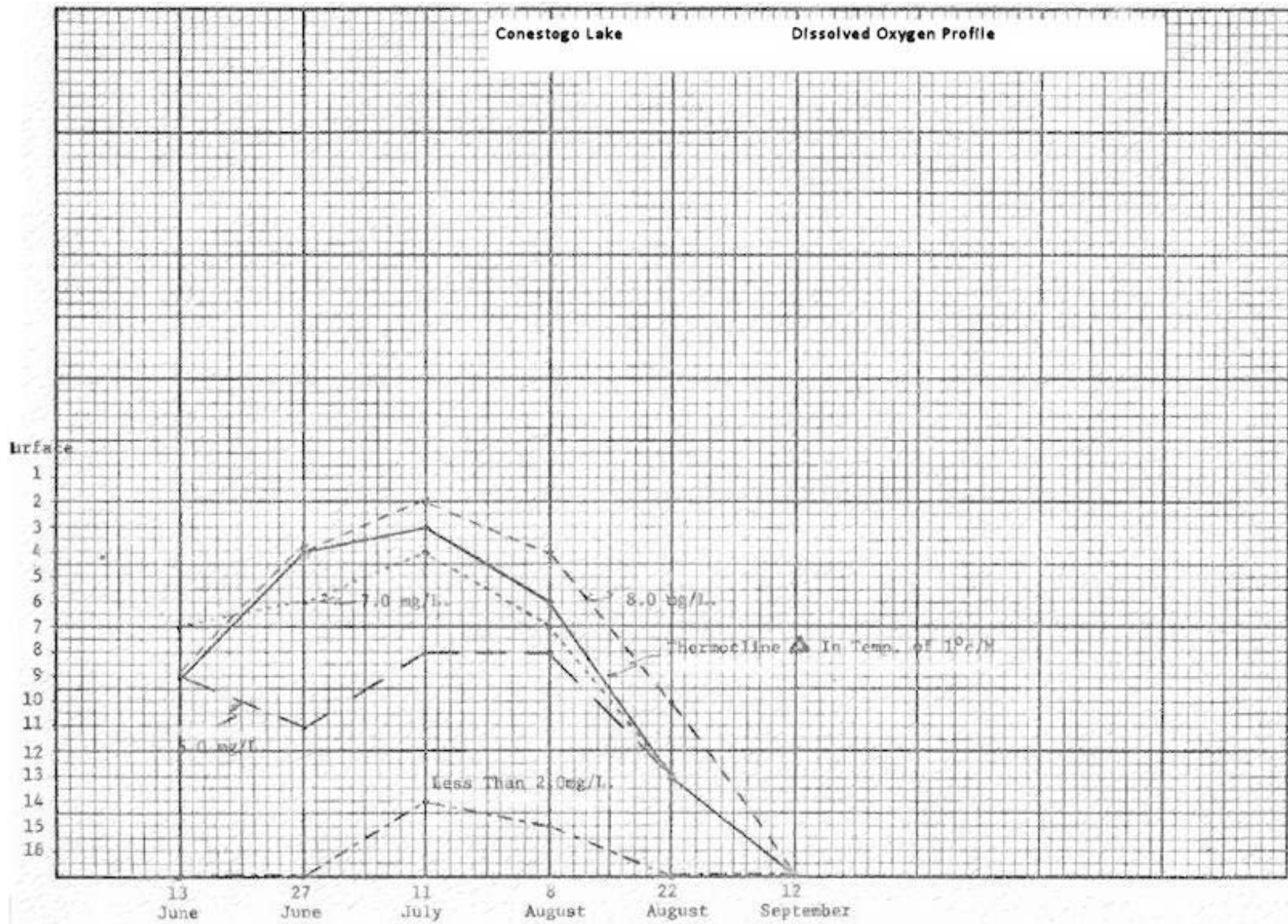
AREA: CONESTOGO LAKE

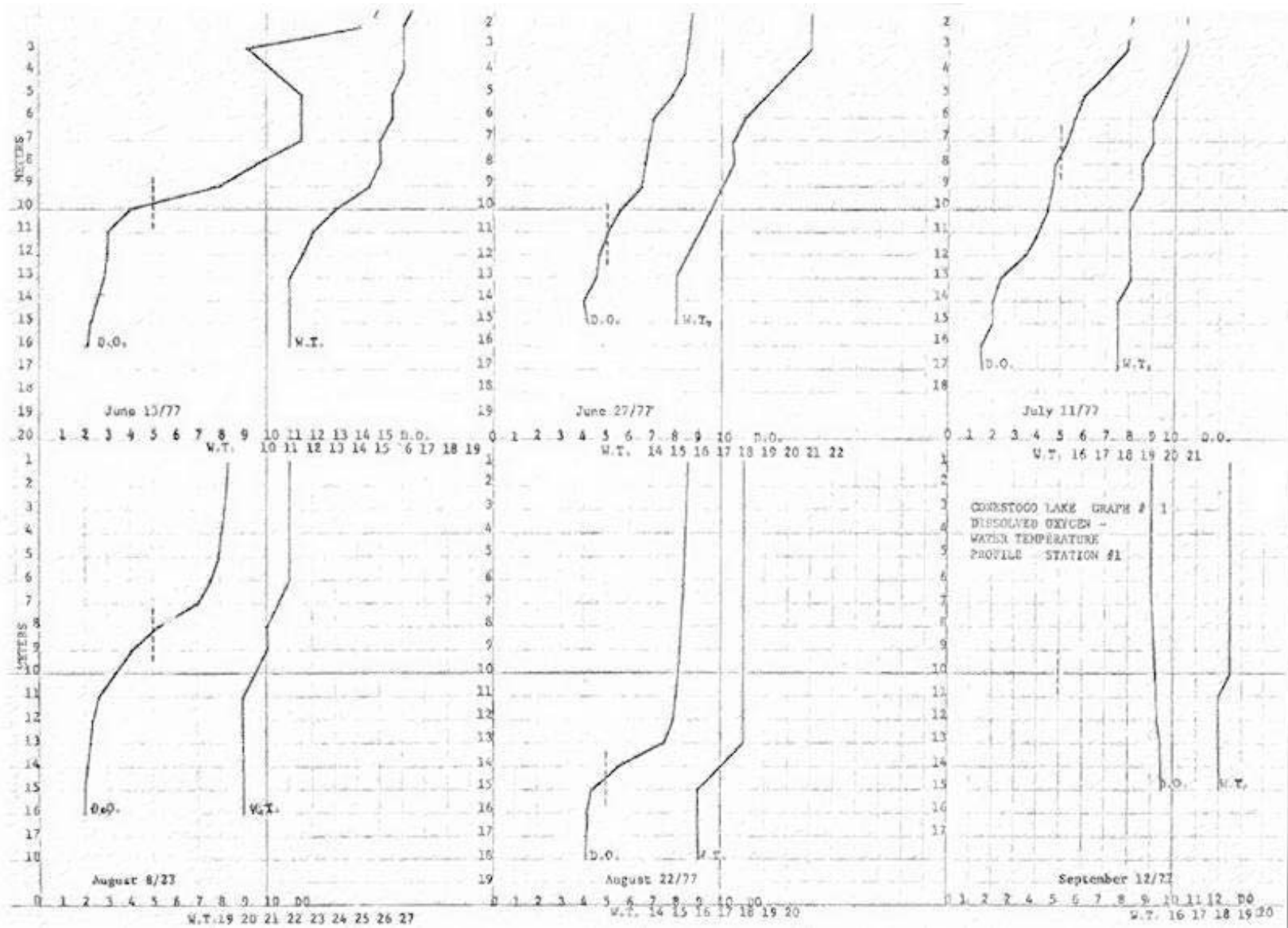
STATION: #1

DEPTH: BOTTOM

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	6.2	11		1.55	0/0	175	195	130	7.3	1.1	0.20	18	0.05	18	1	18.25
June 6	5.0	11	0.9	1.75	340/0	180	195	130	7.6	0.7	0.18	17	0	11	3	18.0
June 13	2.2	12	2.15	2.33		170			7.8	0.8	0.12	18	0.05	18	1	17.5
June 20	4.6	13	1.1	1.15		175			7.9	1.8	0.19	17	0.10	18	2	16.5
June 27	4.2	15	2.0	1.0		170			8.1	1.3	0.15	17	0.14	25	1	15.75
July 4	4.7	18	0.25	1.0		170	190	120	7.5	1.5	0.08	15	0.15	26	1	15.5
July 11	1.5	17.5	1.0	1.20		175			7.8	1.5	0.10	14	0.12	20	2	17.5
July 18	0.6	18	1.3	1.30		180			7.3	1.3	0.10	16	0.15	27	1	18.0
July 25		17	0.65	1.30		170			7.5	1.4	0.10	18	0.19	21	2	17.75
Aug. 3	1.5	19	0.55	1.20		180			7.8	1.4	0.30	19	0.10	21	3	17.25
Aug. 8	2.0	20	2.2	1.25		170	190	120	7.6	1.4	0.29	23	0.19	22	3	16.75
Aug. 15	3.8	20.5	2.1	1.35		170			7.7	1.5	0.45	19	0.05	17	1	17.0
Aug. 22	4.2	16	1.5	1.0		130			7.8	1.5	0.08	24	0.30	16	2	18.5
Aug. 29	5.1	17.5	2.05	1.55		175			7.6	1.4	1.05	23	0.10	22	3	17.0
Labour Day																
Sept.12	9.5	18.0	4.3	1.0		165	200	115	8.5	0.6	0.35	19	0.05	16	1	15.0
Sept.21	7.3	18.0	4.5	0.7		165			8.4	0.75	0.60	23	0.15	13	3	16.0
MAX.	9.5	20.5	4.5	2.35		180	200	130	8.5	1.8	1.05	23	0.30			
AVE.	4.16	16.3	1.79	1.29		170	194	123	7.76	1.15	0.288	18.7	0.12			
MIN.	0.6	11	0.9	0.7		165	190	115	7.3	0.6	0.10	14	0			
# SAMPLES	15	16	15	16		16	5	5	16	16	16	16	16	16		

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 - Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 - Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 - Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate			
	Faecal Coliforms	SO <sub>4</sub>	Sulfate			
ALK	Alkalinity	Fe	Iron			





#### C iv) Reservoir Station #2

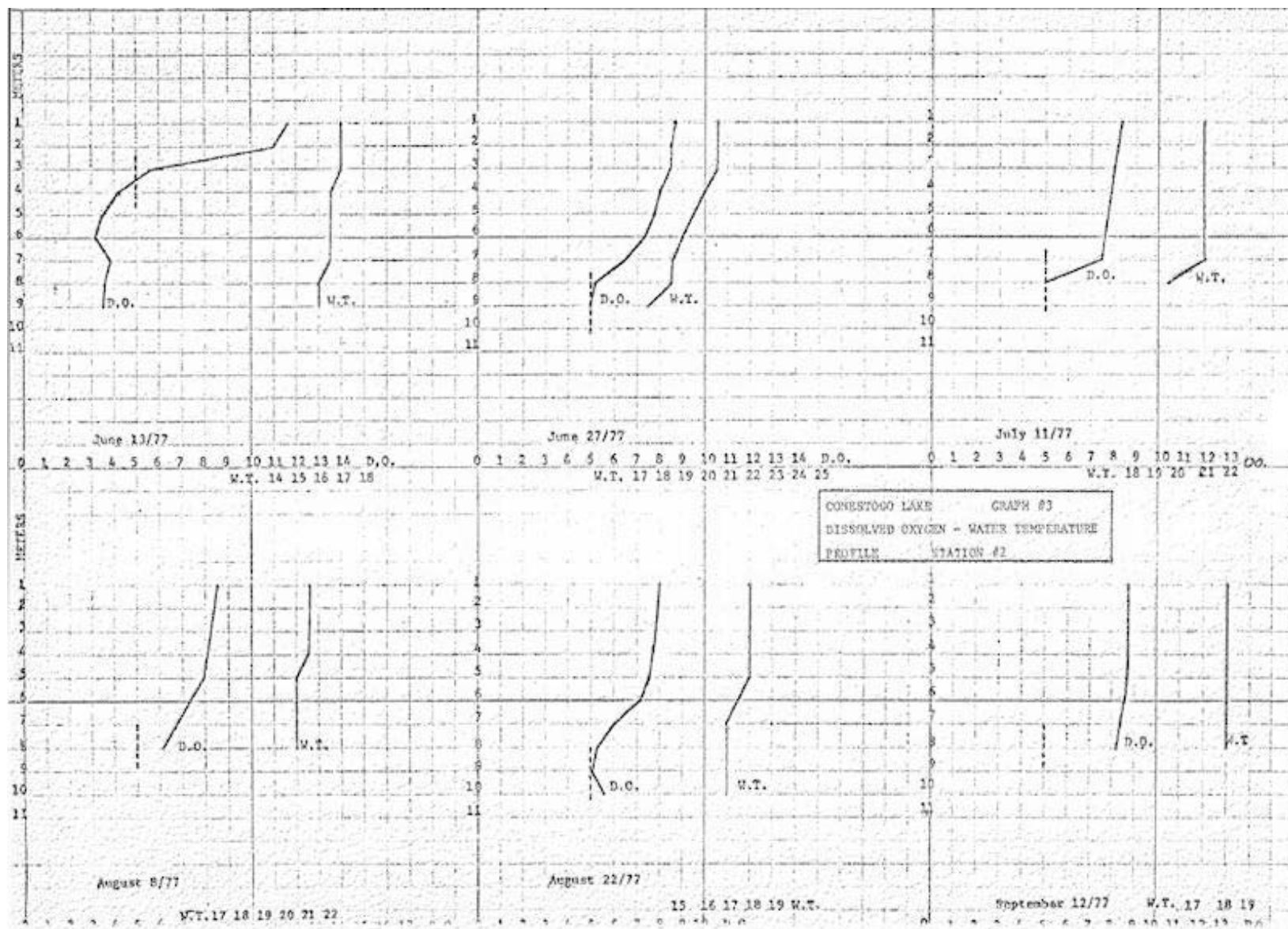
Station #2 was located approximately midway up the northwest, or Spring Creek arm. The depth varied over the summer from 11 metres to 8.25 metres. The water column at this point was quite homogenous. Although the bottom Dissolved Oxygen was always less than the surface Dissolved Oxygen it was only under 5.0 mg/L four of 15 times sampled. The average Dissolved Oxygen on top and bottom was 8.8 mg/L and 6.4 mg/L respectively. The minimum value recorded one metre from the bottom was 1.7 mg/L. It is unlikely that anoxic conditions are present here. (Graph #3 Summer Dissolved Oxygen - Water Temperature Profiles).

A thermocline was not present at station two. Bottom water temperatures were always slightly cooler than at the top. A partial equilibrium was attained by the end of July. That is to say that by that period the maximum difference in surface and bottom water temperatures was 1°C.

BOD<sub>5</sub> values indicate greater enrichment here than at station #1. Average values point out mild organic enrichment with heavy enrichment evident in the latter part of the summer (from August 22<sup>nd</sup> on). Of 15 times sampled, on 11 occasions the bottom BOD<sub>5</sub> was less than or equal to the surface values. Also the BOD<sub>5</sub> values at this station on the average were worse than the inflow (Spring Creek) and outflow. Secchi Disc readings were very poor being 1.16 metres, 2.0 metres and 0.65 metres for the average, maximum and minimum respectively. This parameter would indicate a eutrophic status. Alkalinity, Calcium Hardness and Total Hardness reveal great buffering capacity and very hard water. There were no drastic changes or variations in maximum or minimum values. Total Coliforms and Faecal Coliforms indicate no problems. Only once did the Faecal Coliform value exceed the 100/100 ml criteria. The pH values tend to be on the high side of the scale averaging 8.2 and 8.0 for top and bottom respectively. The established range for recreational waters is 6.5 to 8.3. On six occasions the top and bottom measurements exceeded or equal 8.3. Both top and bottom values are very much the same indicating fairly well-mixed waters.

As nitrates and phosphates flow through Conestogo Reservoir they appear to be greatest at Station #3 and decrease at the other stations. The difference between top and bottom values for both nitrates and phosphates is not significant nevertheless the quantities of these nutrients are high enough to create algal blooms which do occur at Conestogo Reservoir. Sulphates and iron are within their respective ranges. Iron on the bottom did reach a maximum of 0.35 mg/L on one occasion, which is 0.05 mg/L above the accepted limit.





AREA: CONESTOGO LAKE

STATION: #2

DEPTH: TOP

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	12.2	17.5		1.4	14/0	160	185	115	8.1	1.4	0	18	0	22	1	
June 6	10.0	16.5	1.45	1.7	242/0	175	180	110	7.8	0.7	0.02	17	0	11	3	
June 13	11.5	17.0	1.4	2.0	246/0	170			8.2	1.6	0.09	16	0.05	20	1	
June 20	8.6	18.5	1.35	1.0	54/0	180			8.5	1.3	0.10	16	0.05	19	2	
June 27	8.8	20.5	0.85	1.0	50/0	170			8.1	1.2	0.12	18	0.15	26	1	
July 4	8.1	20.0	1.0	1.3	20/0	165	180	110	8.2	1.4	0.15	14	0.15	27	1	
July 11	8.4	21.0	1.15	1.2	6/0	180			7.7	1.3	0	12	0.0	22	2	
July 18	9.1	23.5	1.4	1.25	2/0	170			8.4	1.6	0	12	0.0	27	1	
July 25		22.0	1.0	1.15	40/0	180			8.2	1.4	0	16	0.10	21	2	
Aug. 3	7.2	21.0	0.3	1.0	2/2	160			8.1	1.5	0.10	16	0.05	21	3	
Aug. 8	8.5	21.5	1.0	1.0	8/4	165	180	120	8.0	1.4	0.70	15	0	22	2	
Aug. 15	7.4	21.0	1.6	1.0	22/14	170			8.2	1.4	0.80	17	0	17	1	
Aug. 22	8.0	18.0	4.45	0.60	28/24	165			8.3	1.6	0.35	21	0.20	16	2	
Aug. 29	8.1	20.0	3.75	1.35	20/8	155			8.3	1.3	0.42	20	0.05	22	3	
Labour Day																
Sept. 12	8.6	18.0	4.75	1.0	20/34	165	190	120	8.4	0.6	0.48	22	0.10	16	2	
Sept. 21	8.0	16.5	4.45	0.65	40/122	165			8.4	0.2	0.40	22	0.10	13	3	
MAX.	12.2	23.5	4.75	2.0	242/122	180	190	120	8.5	1.6	0.40	22	0.15			
AVE.	8.8	19.5	1.99	1.16		168	183	115	8.18	1.24	0.23	17	0.06			
MIN.	7.2	16.5	0.30	0.65	2/0	155	180	110	7.7	0.2	0	12	0			
# SAMPLES	11	16	15	18	16	16			16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				

AREA: CONESTOGO LAKE

STATION: #2

DEPTH: Bottom

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	4.7	12.5		1.40	3/0	175	195	135	8.0	1.6	0.20	19	0.05	22	1	11
June 6	10.0	11.5	1.7	1.70	0/0	185	185	115	8.0	0.6	0.19	21	0.18	11	3	11
June 13	3.5	16	2.3	2.0		170			7.5	1.2	0	13	0.10	20	1	10
June 20	8.0	17	1.35	1.0		170			8.0	1.2	0.05	18	0.10	19	2	10.5
June 27	5.1	17.5	1.55	1.0		170			8.0	1.3	0.10	18	0.15	26	1	9.5
July 4	7.5	19.5	0.95	1.30		175	190	115	7.9	1.5	0.10	12	0.20	27	1	8.0
July 11	4.8	19.5	0.95	1.20		170			8.1	1.5	0.13	17	0.10	22	2	8.8
July 18	1.7	20.5	1.1	1.25		180			8.2	1.9	0.15	19	0.25	27	1	9.75
July 25		19.5	0.45	1.15		170			8.0	1.8	0.28	16	0.05	21	2	8.5
Aug. 3	7.0	20	0.65	1.0		165			8.2	1.6	0.10	18	0.08	21	3	9.0
Aug. 8	6.1	21	0.35	1.0		165	190	125	7.6	1.2	0.07	16	0.02	22	2	8.25
Aug. 13	7.4	21	1.6	1.0		170			8.2	1.4	0.25	18	0.10	17	2	8.25
Aug. 22	5.6	17	2.2	0.60		170			7.3	1.5	0.70	28	0.35	16	2	10.5
Aug. 29	8.0	19	2.1	1.35		150			8.4	1.4	0.45	18	0.10	22	3	8.5
Labour Day																
Sept. 12	8.3	18	4.5	1.0		170	190	125	8.6	0.5	0.38	19	0.05	16	2	9.0
Sept. 21	7.7	16	3.35	0.65		165			8.0	0.2	0.30	21	0.10	13	3	9.0
MAX.	10.0	20.5	4.5			185	195	135	8.6	1.9	0.38	28	0.35			
AVE.	6.36	17.8	1.67			170.6	190	123	8.03	1.27	0.22	18.2	0.12			
MIN.	11.7	11.5	0.95			165	185	115	7.5	0.2	0	12	0.05			
# SAMPLES	15	16	15	16		16	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				

c. v) Reservoir Station #3

Station 3 along the main area of the Conestogo River is the shallowest of all reservoir stations varying from 6.5 metres in May to 3.75 metres in early August. As in the two other reservoir stations, the water column at station 3 can be considered well-mixed since there are very few differences between top and bottom.

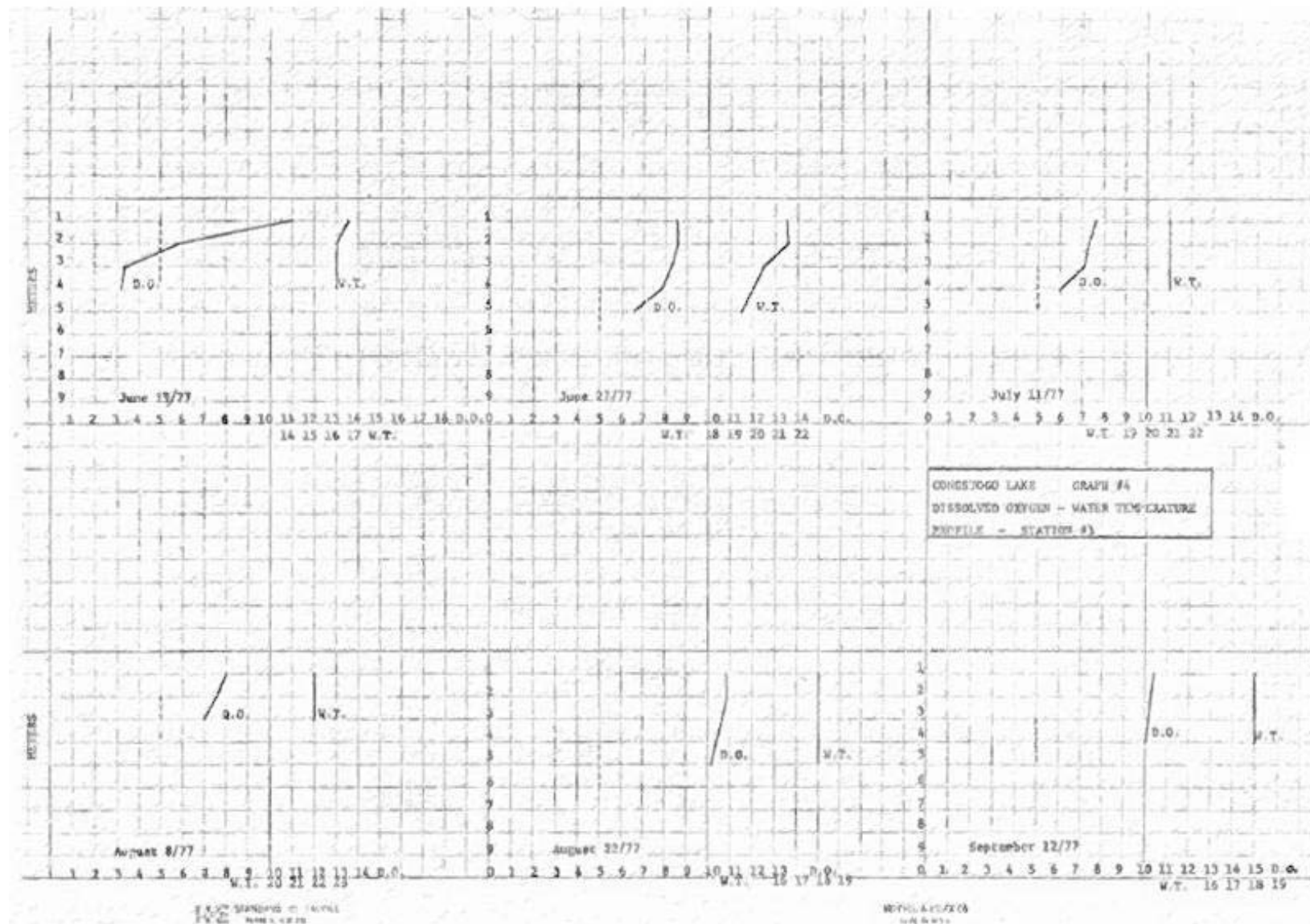
The Dissolved Oxygen one metre from the surface did not fall below 7.5 mg/L during the sampling period. The bottom collections fell below 5.0 mg/L on 2 of 15 occasions. The Dissolved Oxygen presents no problem at this location and its range is slightly greater here as is the average Dissolved Oxygen in Comparison to inflowing values. Water Temperature also illustrates slightly warmer water than at the inflows on the average but not as great a range. Therefore, the surface waters exhibit a slight warming effect (about 1°C) but also a dampening effect. Bottom Water Temperatures were more closely aligned to inflowing values. Bottom waters were always slightly cooler but the temperature gradient from surface to bottom was very gradual and from July on top and bottom temperatures were virtually the same. (Summer Dissolved Oxygen-Water Temperature Profile Graph #4).

Surface BOD<sub>5</sub> samples revealed fairly high or poor values all summer but increased drastically (exceeds 2.35 mg/L) from July 18 through to the end of the sampling period. The range of surface water BOD<sub>5</sub> is from 1.1 mg/L to 9.85 mg/L. The bottom waters do not exhibit such a large range as at the surface (1.1 mg/L to 6.4 mg/L) but in 9 of 15 collections bottom water BOD<sub>5</sub> is the same as or less than the surface BOD<sub>5</sub>. As with the surface, the highest values are recorded in late summer and early fall. There does not appear to be any pattern to the fluctuations of BOD<sub>5</sub>. Of significant importance is the fact that BOD<sub>5</sub> here is greater than the two corresponding inflows.

The Secchi Disc recordings are very poor, the worst of the three reservoir stations being 0.74 metres, 1.45 metres and 0.35 metres for average, maximum and minimum values. As will be pointed out when discussing nitrates and phosphates there is sufficient nutrient at station #3 to create algal blooms which obviously have an effect on water clarity or Secchi Disc recordings. This is further substantiated by end of the

summer complaints of a "bath tub ring" in this particular arm of the reservoir. Due to a tremendous growth of phytoplanktonic algae in late summer during a more noticeable drawdown, the algae was left on the shore as water was removed from the reservoir leaving this surface residue (as dirty water in a bath tub forms a ring on the sides) on the "sides" of the reservoir. Both Total Coliforms and Faecal Coliforms exceed only once during the sampling period and that occurred in early fall. Other than at that time conform<sup>e</sup>ontamination in this area is not significant for recreational purposes.

Alkalinity, Total Hardness and Calcium Hardness are not only similar in comparison of top and bottom waters but are very similar to the values recorded for the other reservoir stations. pH, however, does exceed criterion 3 of 16 times sampled. The average values are over 8.2 (criteria for recreational waters 6.5 - 8.3).



AREA: CONESTOGO LAKE

STATION: #3

DEPTH: TOP

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	12.1	18		1.30	0/0	160	185	115	8.0	1.2	0.18	19	0	23	1	
June 6	9.8	16.5	0.65	1.25	50/2	175	180	120	7.8	0.9	0.20	11	0	11	3	
June 13	11.0	16.5	1.5	1.45	114/2	170			8.0	1.7	0.16	17	0.15	20	1	
June 20	8.7	20	1.6	1.00	10/2	180			8.5	1.3	0.17	19	0.10	19	2	
June 27	8.5	21.5	1.1	0.75	4/0	175			8.4	1.2	0.17	17	0.05	26	1	
July 4	8.5	21	1.6	0.50	16/4	175	170	115	8.0	1.6	0.0	14	0.25	27	1	
July 11	7.5	21	1.65	0.65	8/2	190			8.5	3.8	0.22	19	0.18	22	2	
July 18	8.6	26	2.35	0.85	0/0	185			8.6	2.0	0.17	17	0.10	28	1	
July 25		22	2.55	0.40	36/4	175			8.4	1.6	0.28	20	0.10	21	2	
Aug. 3	8.5	21	2.95	0.50	0/0	170			8.5	1.4	0.0	19	0.20	21	3	
Aug. 8	7.9	22	2.4	0.45	10/24	170	210	120	7.3	1.0	0.1	18	0.10	22	2	
Aug. 15	9.0	21	4.15	0.60	32/38	195			8.5	1.5	0.5	21	0.10	17	1	
Aug. 22	10.8	18	5.75	0.70	30/58	175			8.7	1.1	0.4	21	0.10	11	2	
Aug. 29	9.3	21	5.9	0.60	12/22	180			8.4	0.9	0.52	22	0.05	22	3	
Labour Day																
Sept. 12	10.3	18.0	6.85	0.60	14/4	180	194	125	8.6	0.7	0.22	21	0.05	16	3	
Sept. 21	9.7	16.0	9.85	0.35	TNC/200	195			8.5	0	0.20	22	0	13	3	
MAX.	12.1	26	9.85	1.45	TNC/200	195	210	125	8.7	3.8	0.52	22	0.25			
AVE.	9.35	20	3.39	0.74		178	187.8	119	8.29	1.38	0.22	18.5	0.09			
MIN.	7.5	16	1.1	0.35		160	170	115	7.3	0	0	11	0			
# SAMPLES	15	16	15	16	16	11	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
SEC	Secchi Disc	NO <sub>3</sub>	Nitrate Nitrogen			3 -	Precipitation
COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				

AREA: CONESTOGO LAKE

STATION: #3

DEPTH: BOTTOM

DATE 1977	DO	WT	BOD	SEC	COL T/F	ALK	TH	CaH	pH	NO <sub>3</sub>	PO <sub>4</sub>	SO <sub>4</sub>	Fe	AT °C	Wea	D (m)
May 30	5.2	15		1.30	1/1	185	180	125	7.9	1.2	0.10	20	0.10	23	1	6.3
June 4	6.2	14	1.35	1.25	14/6	180	175	120	7.5	0.5	0.10	18	0.05	11	3	4.0
June 13	3.2	16	1.1	1.45		170			7.6	1.4	0.12	18	0.02	20	1	5.5
June 20	8.2	19	1.25	1.00		180			8.2	1.2	0.12	17	0.10	19	2	5.75
June 27	6.6	19.5	1.1	0.75		180			7.9	1.2	0.12	19	0.06	26	1	5.5
July 4	8.2	21	1.3	0.50		175	190	120	8.2	1.3	0.10	17	0.10	27	1	4.0
July 11	6.1	21	1.75	0.65		185			8.6	3.5	0.31	19	0.21	22	2	4.0
July 18	3.8	24	2.45	0.85		175			8.5	2.4	0.28	19	0.15	28	1	5.0
July 25		27	3.0	0.40		165			8.5	1.6	0.28	19	0.18	21	2	4.75
Aug. 3	7.9	21	2.85	0.50		175			8.2	1.4	0.05	20	0.10	21	1	4.0
Aug. 2	7.1	22	1.25	0.45		170	190	120	8.2	0.8	0.15	18	0.05	22	2	3.75
Aug. 15	7.5	21	3.0	0.60		195			8.4	1.3	0.62	21	0.10	17	1	4.0
Aug. 22	10.2	18	4.25	0.70		175			8.6	1.2	0.35	19	0.10	17	2	5.75
Aug. 29	9.1	21	6.2	0.60		175			8.2	1.5	0.55	22	0.05	22	3	6.0
Labour Day																
Sept. 12	10.0	18	6.3	0.60		185	185	120	8.6	0.8	0.25	24	0.10	16	2	4.5
Sept. 21	8.0	15	2.9	0.35		290			8.0	0.5	1.1	26	0.30		3	4.0
MAX.	10.2	24	6.3			290	190	125	8.6	3.5	0.62	26	0.30			
AVE.	7.15	19.2	2.54			185	184	121	8.2	1.38	0.29	19.75	0.11			
MIN.	3.2	14	1.1			170	175	120	7.5	0.5	0.10	17	0.05			
# SAMPLES	15	16	15	10		16	5	5	16	16	16	16	16			

DO	Dissolved Oxygen	TH	Total Hardiness	AT	Air Temperature	Weather Code	
WT	Water Temperature	CaH	Calcium Hardness	Wea	Weather	1 -	Sunny
BOD <sub>5</sub>	Biochemical Oxygen Demand.	pH	pH	D	Depth	2 -	Cloudy
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COL	Total Coliforms	PO <sub>4</sub>	Phosphate				
	Faecal Coliforms	SO <sub>4</sub>	Sulfate				
ALK	Alkalinity	Fe	Iron				



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