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OPERATING SUMMARY

WATER SUPPLY SYSTEMS

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1974
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Ministry of the
Environment

Hon. William G. Newman, Minister
Everett Biggs, Deputy Minister

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WATER SUPPLY SYSTEMS

Operated by the Ministry of the Environment

prepared by
Technical Services Branch
July, 1974

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LIST OF PROJECTS

SURFACE WATER PROJECTS

PROJECT	RAW WATER SOURCE	DESIGN CAPACITY in MGD							Storage mil gal
		PUMPS		Micro- strainer	Settling tank	Filter	@ gpm/ft ²		
		low-lift	high-lift						
1. Amherstburg	Detroit River	9	10		4.0	4.0	1.7		
2. Bancroft	Clark L.	Gravity			Chlorination Only				
3. Beaverton	Lake Simcoe	.8	service pump		.55	1.7	.10		
4. Blenheim	Lake Erie	2.0	2.0		1.0	1.0	2.9		
5. Bobcaygeon	Big Bob River	.27	filter pump		.20	0.5			
6. Cache Bay	Tanner Lake	Gravity			Chlorination Only				
7. Chalk River	Corry Lake	Gravity			Chlorination Only				
8. Comber Twp.		Pipeline Only							
9. Dresden	Sydenham River	.86	.86		.5			.86	
10. Dunnville	Lake Erie	24	58	20.5				.2	
11. Ear Falls	English River	.14	duty pump		Chlorination Only				
12. Eganville	Bonnechere River				.18	1.6			
13. Elgin Area	Lake Erie	10	10		10	10	3.2	6	
14. Emo Twp.	Rainy River			.08	Microfloc pkg. unit				
15. Espanola	Apsey Lake	1.5		Chem. Add. only					
16. Fenelon Falls	Cameron Lake	.24	service p.		.36	2.5	.008		
17. Geraldton	Reesor Lake	Chlorination Only							
18. Goderich	Lake Huron	2.6	2.8		3.0	3.0	3.6	.54	
19. Haileybury	Lake Timiskaming	2.6	3		1.5	1.5	2.3	.6	
20. Harrow	Lake Erie		3.4	1.25					
21. Hastings	Rice Lake	Chlorination Only							
22. Lake Huron WSS	Lake Huron	42	37		40	2.1	13.4		
23. Lambton County WSS	Lake Huron	Chlorination &		Fluoridation					
24. Marmora	Crow River	.22a	duty p.		.50	2.6	.44		
25. Meaford	Nottawasaga Bay	6.0	3.7		2.9	1.6	.33		
26. Michipicoten Twp.	Wawa Creek	Chlorination only							
27. Moosonee	Store Creek	.14	.20		.15	.12	1.5		
28. Red Lake	Skookum Bay	.25	duty pump		Chlorination Only				
29. Rockland	Ottawa River	2	2.2		.8	.8	2.4		
30. Southampton	Lake Huron	2.0b	filter p.		1.0	1.7	.10		
31. South Peel WSS	Lake Ontario	90	80		48	48		54	
32. Union WSS	Lake Erie		23		16				
33. Warkworth	Mill Creek	.14	.22		.10	2.0	.11		
34. Watford, Wyoming & Plympton		Pipeline only							

a - Plus 100% standby

b - Plus 3 mgd diesel powered pump

GROUND WATER PROJECTS

PROJECT	Nominal Capacity MGD	DESCRIPTION
35. Alfred		Chlorination
36. Anson, Hindon & Minden		Chlorination
37. Blezard Valley		Chlorination
38. Blind River		Pumping only
39. Bolton		Chlorination
40. Bradford		Chlorination
41. Brantford Twp.		Chlorination
42. Brock Twp.		Pumping only
43. Caledon E.		Pumping only
44. Chesterville		Chlorination
45. Clarke Twp.		Pumping only
46. Cookstown		Chlorination
47. Elmvale		Pumping only
48. Fauquier Twp.	.07	Chlorination, aeration, filtration, (iron removal)
49. Frankford	.54	Pumping only
50. Hanover		Pumping only
51. Havelock		Chlorination (1 of 2 wells only)
52. King Twp. Schomberg	.14	Zeolite softeners, chlorination
53. Markham - Don Mills		Chlorination, sequestering
- John Street		Chlorination, aeration, filtration, (iron removal)
- Steeles Ave.		Chlorination, aeration, filtration, (iron removal)
- Pharmacy		Chlorination, sequestering
54. Mitchell		Chlorination, aeration, filtration, (iron removal)
55. Newcastle		Chlorination
56. Orangeville		Pumping only
57. Plantagenet		Pumping only
58. Playfair Twp.		Pumping only
59. Port Perry		Chlorination
60. Preston		Chlorination
61. Ratter & Dunnet		Pumping only
62. Richmond Hill		Chlorination
63. Richmond Hill	.47	Chlorination, pres. filtration (iron removal)
- Oak Ridges		Chlorination
64. Shelburne		Chlorination
65. Stayner		Chlorination
66. Thedford		Chlorination
67. Vankleek Hill		Chlorination
68. Wellington		Chlorination
69. Whitby Twp.	.16	Chlorination, aeration, filtration, (iron removal)
70. Winchester		Chlorination, sequestering
71. Woodville		Chlorination
72. Woolwich Twp.		Chlorination, filtration, (iron removal)

INTRODUCTION

Project Operations Branch of the Ministry of the Environment prepares annual operating summaries on staffed projects which have been in operation for at least one year. This report summarizes data from 74 water supply projects, not all of which provide treatment. In one case, Watford, Wyoming and Plympton, the project is a pipeline delivering water purchased from the Sarnia system.

During 1973 these projects supplied 38.8 billion gallons of water, 35.2 billion gallons from surface water sources and 3.6 billion gallons from ground water supplies.

This summary makes no attempt to delineate operating problems at individual plants. The nature of operating problems and unusual conditions, along with more detailed data, is contained in individual plant operating summaries.

OPERATING DATA

PLANT FLOWS

Table I summarizes flow data, including maximum rates where available. Design capacities listed for projects affording physical treatment (that is, microstraining, sedimentation and filtration) do not include reduction in potential output due to in-plant use of water for purposes such as backwashing of filters. Where no treatment, or chemical treatment only (usually chlorination) is provided, the maximum output is limited by pumping capacity.

A total of 38,800 million gallons of water was produced: 35,200 million gallons by surface water supplies and 3,600 million gallons by ground water supplies. Two projects, the Lake Huron Water Supply System, and the South Peel Water Supply System accounted for more than half of the total.

TABLE I

PLANT FLOWS

SURFACE WATER SUPPLIES

PROJECT	DESIGN CAPACITY mgd	TOTAL OUTPUT million gal	AVERAGE DAY million gal	MAXIMUM DAY million gal	MAXIMUM RATE mgd
Amherstburg	4.0	349.	.96	1.5	2.5
Bancroft		240.	.066	.09	
Beaverton	.55	130. est	.36	.82	
Blenheim	1.0	159.	.44	.59	1.0
Bobcaygeon	.2	23.5	.064	.16	.14
Cache Bay		13.6	.037	.07	
Chalk River		19. est	.052	.20	.43
Comber Twp.		23.4	.064		
Dresden	.5	125.	.34	.67	.77
Dunnville	20.	3770.	10.	13.	
Ear Falls	.14	37.0	.10	.16	
Eganville	.18	22.7	.062	.12	
Elgin Area W. S. S.	10.	1450.	4.0		
Emo Twp.	.08	14.5	.039	.04	
Espanola	1.5	208.	.57	1.4	
Fenelon Falls	.36	57.7	.16	.36	.52
Geraldton		177.	.49	1.5	
Goderich	3.0	392.	1.1	2.0	3.0
Haileybury	1.5	150.	.41	.81	
Harrow		Not Available			
Hastings		36.2	.10	.50	
Lake Huron	37.	9080.	25.	34.	37.
Lambton County W. S. S.		4140.	11.	10.	16.
Longlac		Not Available			
Marmora	.23	36.7	.10	.40	
Meaford	2.9	349.	.96	1.6	
Michipicoten		Not Available			
Moosonee	.11	42.8	.12	.17	
Red Lake	.25	132.	.36	.53	
Rockland	.8	225.	.62	.9	
Southampton	1.0	133.	.36	1.7	
South Peel - Lakeview	48.	11600.	.32	65.	63.
Union W. S. S.	16.	1740.	4.7	10.	13.
Warkworth	.10	18.0	.049	.16	
Watford Wyoming & Plympton		27. est	.18		

GROUND WATER SUPPLIES

PROJECT	DESIGN CAPACITY mgd	TOTAL OUTPUT million gal	AVERAGE DAY million gal	MAXIMUM DAY million gal	MAXIMUM RATE mgd
Alfred		21.7	.059		
Anson, Hindon & Minden		16.3	.044	.11	
Blezard Valley		187. a	.61		
Blind River		51.1	.14	.26	
Bolton		103.	.28	.59	
Bourget		Not available			
Bradford		136.	.37	.49	
Brantford Twp.		48.2	.13	.29	
Brock Twp.		20.8	.057	.15	
Caledon East		22.1	.060	.23	
Chesterville		23. est	.063		
Clarke Twp.		19.9	.054	.10	
Cookstown		155.	.42	.78	
Elmvale		44.1	.12	.46	
Fauquier Twp.	.07	15.1	.041	.08	
Frankford		47.9	.13	.31	
Hanover		111.	.31		
Havelock		27.7	.075		
King Twp. - Schomberg	.14	16.6	.045	.11	
Markham - Don Mills		236.	.65	1.9	2.0
- John Street Plant		365.	1.00		
- Steeles Ave.		205.	.38		
- Pharmacy		266.	.96	2.1	.86
- TOTAL		1072			
Mitchell		136.	.37	.64	
Newcastle		20.8	.057	.13	
Orangeville		337.	.92		
Plantagenet		Not Available			
Playfair Twp.		Not Available			
Port Perry		88.7	.24	.50	
Preston					
Ratter & Dunnet		12.3	.033	.08	
Richmond Hill		140. est	.33	.87	
Richmond Hill - Oak Ridges	.47	43. est	.12	.24	
Shelburne		78.5	.21		
Stayner		74.4	.20	.35	
Thedford		18. est	.049	.12	
Vankleek Hill		24.1	.066	.13	
Wellington		21. est	.057	.16	
Whitby Twp.	.16	27.1	.074	.16	
Winchester		61.7	.17	.15	
Woodville		1.03 b	.007		
Woolwich Twp.		20.2	.055	.17	

a - 10 months' flows

b - 137 days' flows

WATER QUALITY

Bacteriological Quality

Tables II and III are summaries of bacteriological sampling carried out during 1973. The indicator organisms used were total coliform. The results for raw water are tabulated to provide an approximation of geometric means taking the logarithm of coliforms less than 4 as being 0, from 4 to 32 as 1, from 33 to 320 as 2 and coliforms greater than 320 to 3. The geometric mean of n samples is antilog $\frac{(\log x_1 + \log x_2 + \dots \log x_n)}{n}$

Samples of treated water are taken leaving the plant and in the distribution system up to the point of delivery of the water, which in some cases is the ultimate consumer and in others the municipal distribution system.

Chemical Quality

The results of chemical analysis are shown as arithmetic mean values in Tables IV and V for surface waters and ground waters respectively. Where no treatment is provided, or where treatment does not alter the parameter, the figure shown is of all analyses both raw and treated water. In many cases these averages are based on very few samples, and in some cases, the values shown have come from samples taken in investigating consumer complaints. The data tabulated may, therefore, not be entirely representative of the normal finished product.

Physical Characteristics

Turbidity, color and temperature data for surface water supplies and turbidity and color for ground water supplies is contained in Tables VI and VII. Where no facilities exist for the removal of turbidity and colour (coagulation and filtration), that is, where raw water with, perhaps, chemical addition is pumped directly into the distribution system, averages of all samples are shown as treated water. Ground water temperatures are assumed to be constant and equal to ground temperatures, therefore they are not recorded. It would appear from the limited data on turbidity and color that ground waters (Table VII) frequently exceed the desirable criteria of 1.0 F. T. U. turbidity and 5 units apparent color.

TABLE II

BACTERIOLOGICAL

QUALITY

SURFACE WATER SUPPLIES

PROJECT	AVG-CHLORINE RESIDUAL mg/l	NUMBER OF SAMPLES HAVING TOTAL COLIFORMS (per 100 ml) OF:								
		0	1-3	4-32	33-320	> 320	0	≥ 1	0	≥ 1
		RAW WATER					LEAVING PLANT		IN DISTRIB ⁿ SYSTEM	
Amherstburg	.6	0	0	0	3	50	52	0	163	2
Bancroft	.7	18	12	12	7	7	39	0	244	0
Beaverton	.5	0	1	3	2	2	7	0	14	0
Blenheim	.8	34	0	13	0	2	47	0	94	0
Bobcaygeon	.5	2	2	8	19	8	39	0	153	0
Cache Bay	.6	10	1	8	3		21	1		
Chalk River		1	3	13	12	0	41	2	124	3
Dresden	1.0	2	1	3	7	26	53	0	0	0
Dunnville	.5	0	2	2	5	36	44	3	0	0
Ear Falls	.5	20	13	17	5	0	31	0	37	3
Eganville	.5	44	0	2	4	5	201	3	17	0
Elgin Area	.7	59	13	11	3	0	147	0	157	0
Emo Twp.	.6	0	0	0	2	40	59	0	187	0
Espanola	.7	11	0	6	4	7	34	0	248	2
Fenelon Falls	.7	4	2	12	12	19	31	0	239	0
Geraldton	1.0	7	1	1	2	2	7	0	14	0
Goderich	.9	17	7	14	10	4	51	0	206	0
Haileybury	.6	0	0	0	0	0	22	0	22	0
Harrow		2	0	4	11	8	25	0	50	0
Hastings	1.1	0	0	0	0	0	3	0	195	70
Lake Huron										
Lambton County	.6	32	4	10	3	0	351	0	0	0
Longlac		Not Available								
Marmora	.5	0	0	1	15	13	29	0	56	2
Meaford	.4	9	5	11	4	16	52	1	102	0
Michipicoten				1	1	2	8	0	25	0
Moosonee	.5	1	6	6	1	0	11	0	4	0
Red Lake	.7	1	0	0	0	0	6	0	5	0
Rockland	.6	0	0	0	9	39	49	0	124	6
Southampton	.5	18	5	5	11	0	0	0	98	2
South Peel - Lakeview	.6	5	8	17	11	11	52	1	568	8
Union W. S. S.	.5	0	0	11	21	18	48	0	446	2
Warkworth	.7	0	0	2	16	20	37	1	78	0
Watford, Wyoming & Plympton		0	0	0	0	0	0	0	15	0

TABLE III

BACTERIOLOGICAL QUALITY

GROUND WATER SUPPLIES

PROJECT	AVG CHLORINE RESIDUAL mg / l	NUMBER OF SAMPLES HAVING TOTAL COLIFORMS (per 100 ml) OF:																				
		0					1-3		4-32		33-320		>320		0		≥1		0		≥1	
		RAW					WATER					LEAVING		PLANT		IN DISTRIB ⁿ		SYSTEM				
Alfred	.4	10	2	9	10	2	63	2	33	2												
Anson, Hindon & Minden	.03	0	0	0	0	0	0	0	47	1												
Bleazard Valley	.2	18	0	0	0	0	0	0	4	0												
Blind River		Not Available																				
Bolton		3	0	0	0	0	3	0	24	12												
Bourget		Not Available																				
Bradford	1.2																					
Brantford Twp.	.3																					
Brock Twp		7							19													
Caledon East		37	1						28	0												
Chesterville	.5	7	0	2	3	0	0	0	71	2												
Clarke Twp.		0	0	0	0	0	19	0	57	0												
Cookstown		1	0	0	0	0	0	0	2	0												
Elmvale		39	0	0	0	0	0	0	121	2												
Fauquier Twp.		22	0	0	0	0	22	0	44	0												
Frankford		0	0	0	0	0	14	1	116	1												
Hanover		14	5	0	3	0	11	0	0	0												
Havelock		1	0	0	1	0	0	0	40	0												
King Twp. - Schomberg		18	0	0	0	0	18	0	36	0												
Markham		105	0	0	0	0	58	0	254	1												
Mitchell		48	0	1	0	0	33	0	69	0												
Newcastle	.4	0	0	0	0	0	4	0	12	0												
Orangeville																						
Plantagenet		Not Available																				
Playfair																						
Port Perry	1.0	8	0	0	0	0	8	0	16	0												
Preston		Not Available																				
Ratter & Dunnett		6	0	0	0	0	0	0	37	0												
Richmond Hill		12	1	0	1	0	9	0	107	0												
Richmond Hill - Oak Ridges		8	0	0	0	0	11	0	24	0												
Stayner		54	0	4	2	0	49	0	21	0												
Thedford		22	0	0	0	0	22	0	44	0												
Vankleek Hill	.4	38	4	3	6	2	63	2	64	1												
Wellington	1.4	17	5	9	4	6	19	0	143	3												
Whitby Twp.		10	1	0	0	0	10	0	22	0												
Winchester	.7	89	3	0	0	0	0	0	223	9												
Woodville		2	0	0	0	0	1	0	9	0												
Woolwich Twp.	.2	22	0	0	0	0	5	0	46	0												

TABLE IV

CHEMICAL CHARACTERISTICS

SURFACE WATER SUPPLIES

NOTE: Data shown as RAW/TREATED or as average of all samples (see text):

PROJECT	HARDNESS mg/l CaCO ₃	ALKALINITY mg/l CaCO ₃	IRON mg/l Fe	CHLORIDE mg/l Cl ⁻	pH pH units	FLUORIDE mg/l F ⁻	AMMONIA mg/l N	KJELDAHL NITROGEN mg/l N	NITRATE +NITRITE mg/l N	TOTAL PHOSPHORUS mg/l P	PHENOL μg/l C ₆ H ₅ OH	SULFATE mg/l SO ₄ ⁻²	ALUMINUM mg/l Al	COPPER mg/l Cu	CALCIUM mg/l Ca	CONDUCTIVITY micromhos per cubic centimeter
Amherstburg	110	80	.9/<.05	24	7.5	.1/.3										
Bancroft	39	31	.05	3	7.6											
Blenheim	130/130	94/77	.6/<.05	23	7.7	.1/.7										
Cache Bay	28	13	.18	2	7.2	30										
Comber	170	140	1.8	19	7.7											
Dresden	290/230	200/130	1.2/.06	20	7.8/8.2											
Dunnville	140	105	.13	25	8.1	.1	8.1	.1		14						
Ear Falls	39	38	.36	1	7.4											
Eganville	60	45	.13/.08	6	7.5											143/138
Elgin Area	140	95	.80*.05	23	7.6	.1/15	.06	.27/09	.30	.072			.24/.25			
Emo Twp.	30	28/53	.39*.05	1/7	7.1											
Espanola	32	17	.12	6	7.3	.2/.8										
Fenelon Falls	57	42	.10/1.2	4	7.5											
Geraldton	140	130	.20	4	7.8											
Goderich	130	107/88	1.1/.05	11	7.6	.3/.8										
Halleybury	30/46	20	.8/.12	3	8.0	.1								.7/.5		
Harrow	126	87	.51	28	7.6											
Hastings	110	90	.15	10	8.3											
Lake Huron																
Lambton County	100	82	<.10	7	8.0											
Longlac	97	93	.80/.21	3	7.3											
Marmora	Not Available															
Meaford	95	73	.35/<.05	7	8.1											
Michipicoten Twp.	70	41	.05	2	8.0											
Moosonee	170	160	.76/.14	240	8.0	.3/1.0										
Red Lake	26	25	.09	<1/2	7.1											
Rockland	47/103	31/79	.70/<.05	4/44	7.5									.12	.19	68/85
Southampton	90	83	4	8	7.8											
South Peel - Lakeview	140	95	.27/<.06	32	8.0/7.0	.3/.8	05/.07				4/2					
Union	120	85	1.3/<.05	21	7.7/7.2											
Warkworth	220	200	.18/<.07	6	8.3											
Watford, Wyoming & Plympton	Not Available															

TABLE V

CHEMICAL CHARACTERISTICS

GROUND WATER SUPPLIES

NOTE: Data shown as RAW/TREATED or as average of all samples (see text).

PROJECT	HARDNESS mg/l CaCO ₃	ALKALINITY mg/l CaCO ₃	IRON mg/l Fe	CHLORIDE mg/l Cl ⁻	pH pH units	FLUORIDE mg/l F ⁻	AMMONIA mg/l N	KJELDAHL NITROGEN mg/l N	NITRATE +NITRITE mg/l N	TOTAL PHOSPHORUS mg/l P	PHENOL μg/l C ₆ H ₅ OH	SULFATE mg/l SO ₄ ⁻²	ALUMINUM mg/l Al	COPPER mg/l Cu	CALCIUM mg/l Ca	CONDUCTIVITY micromhos per cubic centimeter
Alfred	292	246	.10	222	7.6		<.1		6.61						73	1320
Anson, Hindon & Minden	135	90	.50	4	8.1											
Blezard Valley	121	52	.21	33	8.0											
Bolton	212/208	216	.70/.60	22	7.8											
Boungat	68	120	.18	28	7.5		.04	.22	.05						18	320
Chesterville	362	285	.65	83	7.5											
Clarke Twp.	322/344	241/247	<.05	31	7.4											
Elmvale	171	178	<.05	3	7.9											
Fauquier Twp	337/340	338	1.75/93	7	7.6/7.8											
Frankford	284	245	<.05	12	7.8											
Hanover	379	221	.26	5	7.7											
Havelock	295	246	<.05	27	7.5											
King Twp. - Schomberg	256/86	328/382	2.0/.80	3/5	7.9/8.5											
Markham - Don Mills	319	263	.91	35	7.6	.1										
- German Mills Wells	366	324	.93	42	7.6	.1										
- John St. Plant	388	324	.70		7.5		.88		2.44			60				
- Pharmacy	267	275	1.2	7	7.8	.1										
Mitchell	266/246	200	.49/.08	6	7.7											
Plantagenet	490	380	1.3	181	7.3		.26	.30	.17						142	1490
Playfair	342	346	<.05	10	7.4											
Port Perry	223	222	.4	4	7.7											
Ratter & Dunnett	273	216	<.05	18	7.2											
Richmond Hill	426/312	295/267	2.0/1.0	36/2	7.4/7.7											
Richmond Hill - Oak Ridges	254/271	253/249	1.9/.7	3	7.7											
Stayner	250	233	.16	3	7.7											
Thedford	93	210	.25	26	7.8	2.0										
Wellington	Not Available															
Whitby Twp.	272	227	.75/1.96	7/8	7.6											
Winchester	318	315/246	.09/.18	69/258	7.5/7.8											
Woodville	316	244	.10	12	7.4				8.9							
Woolwich Twp.	571/538	201/204	.58/<.18	2/3	7.5		.19/4.09									1032/1120

TABLE VI

PHYSICAL CHARACTERISTICS

SURFACE WATER SUPPLIES

PROJECT	TURBIDITY					APPARENT COLOUR					TEMPERATURE	
	RAW WATER		TREATED WATER		% of samples >1.0 FTU	RAW WATER		TREATED WATER		% of samples > 5 units	AVERAGE	MAXIMUM
	AVERAGE FTU	MAXIMUM FTU	AVERAGE FTU	MAXIMUM FTU		AVERAGE units	MAXIMUM units	AVERAGE units	MAXIMUM units		°F	°F
Amherstburg	14	60	.7	2.6	20						54	78
Bancroft			.4	.6	0	<5	20	< 5	<5	0		
Blenheim	12	57	.7	4.4	12	15	75	< 5	< 5	0	52	77
Bobcaygeon	3	5.9	.5	.6	0	8	20	< 5	10	33		
Cache Bay			1.0	1.3	50			10	10	100		
Dresden											51	78
Dunnville	26	160	11	38	100	8	50	12	70	33	50	79
Ear Falls			4	8	100			32	50	100		
Eganville	1.6	1.8	.9	1.0	0	13	20	12	15	100	44	76
Elgin Area W. S. S.	32	200	1.1	3.4	40	57	70	< 5	< 5	0	54	72
Emo Twp.	6	16	.6	1.5	10	44	70	< 5	5	0	50	72
Espanola			2.7	70	84			5	15	24		
Fenelon Falls	.6	.8	.5	.7	0	16	25	8	20	33	54	80
Geraldton			.9	1.4	10			15	50	38		
Goderich	15	24	1.0	1.0	40	24	70	< 5	5	0	50	79
Haileybury	8	17	2.0	15	60	47	65	5	15	20	50	70
Harrow			10	25	100			35	40	100		
Hastings			3	6	100			10	30	75		
Lake Huron	12	30	.4	2.8	42			5	< 5	0	49	74
Lambton County W. S. S.	15	50	2.7	9	100	<5	< 5				48	73
Longlac	2	4	.7	.9	0	30	40	22	30	100		
Marmora												
Meaford	2.5	13	.8	1.6	33	5	< 5	< 5	< 5	0	46	72
Michipicoten Twp.			.5	.5				< 5	< 5	0		
Moosonee	3.6	7.9	1.5	3.2	80	120	200	7	40	25	42	62
Red Lake	.8	1.5	.5	.7	0	21	30	10	20	75		
Rockland	8	16	.1	1.5	25	44	65	< 5	< 5	0	50	76
Southampton	1.8	5.8	1.5	2.2	66	< 5	15	< 5	< 5	0		
South Peel - Lakeview	10	130	.8	5.5	20	5	30	< 5	30	0	50	81
Union W. S. S.	17	84	.2	1.5	4	17	100	< 5	< 5	0	52	78
Warkworth	3.0	7.1	1.5	6.1	17	13	20	5	15	17		

TABLE VII

PHYSICAL CHARACTERISTICS

GROUND WATER SUPPLIES

PROJECT	TURBIDITY					APPARENT COLOUR				
	RAW WATER		TREATED WATER			RAW WATER		TREATED WATER		
	AVERAGE FTU	MAXIMUM FTU	AVERAGE FTU	MAXIMUM FTU	% of samples >10 FTU	AVERAGE units	MAXIMUM units	AVERAGE units	MAXIMUM units	% of samples > 5 units
Alfred								< 5	< 5	0
Anson, Hindon & Minden										
Bleazard Valley										
Bolton			1.9	2.1	100			< 5	< 5	0
Bourget			1.9	2.0	100			.12	.15	0
Chesterville										
Fauquier Twp.	4.3	8.4	.8	1.6	27	< 5	50	< 5	10	7
Havelock			.5	.5				< 5	< 5	0
King Twp. Schomberg	5	14	3.2	8.0	50	10	15	7	10	33
Markham			2.0	4.8	56			< 5	< 5	0
Mitchell	7	12	.9	.9	0	30	50	< 5	< 5	0
Plantagenet			2.5	3.6	100			18	20	100
Port Perry			3.4	5.3	100			< 5	5	0
Richmond Hill	19	19	2.3	2.3	100	< 5	< 5	40	40	100
Richmond Hill - Oak Ridge	16	61	.9	1.3	50	17	40	8	10	50
Whitby Twp.	7	9	.3	.5	0	10	15	< 5	< 5	0
Woodville	.5	.5				< 5	< 5			

PROCESS DATA

The results of raw water algae enumeration are summarized in Table VIII tabulating average monthly values of total algae. Data on microstrainer performance was available only from the Union WSS which uses a microstrainer medium with openings of 35 microns.

The quantities of chemicals used in the treatment processes including disinfection are presented in Table X for both surface water and ground water projects. Sodium silicate is used as a flocculant aid in the surface water projects as "activated silica". Its use in ground water projects is for sequestering iron. Of the three plants using polymers, Emo Township used NACOLYTE 671 and Moosonee and Rockland used SEPARAN.

The data available on filter operation is summarized in Table XI. Since many of these plants are not staffed 24 hours per day, the filters are washed at regular intervals rather than on the basis of head loss.

Since there is a move to require treatment of process wastes rather than discharging these streams to the raw water source, data has been collected on volumes and chemical characteristics of filter wash water and of sludge from clarifiers and settling basins.

TABLE VIII

TOTAL ALGAE - RAW WATER

NOTE: Values are geometric means for the periods indicated.

PROJECT	1973 AVERAGE ASU/ml	TOTAL ALGAE - in Areal Standard Units per milliliter											
		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
Amherstburg	540					1800	1400	320	190	310	620	470	630
Blenheim	740					460	250	470	1400	1000	1400	910	1600
Dunnville	650	460	520	590	850	780	590	560	780	570	1000	890	650
Goderich	350		180	280		1200							
Lake Huron	93	160	140	210	100	260	400	130	10	32	120	80	100
South Peel	160	95	67	110	460	520	400	72	200	190	130	100	120
Union	3600	2900	3200	4300	5100	3300	4500	2600	3400	2300	3200	3400	4300

TABLE IX

MICROSTRAINER PERFORMANCE

PROJECT	TOTAL			BLUE-GREEN			GREEN			FLAGELLATES			DIATOMS		
	ASU/ml		% red ⁿ	ASU/ml		% red ⁿ	ASU/ml		% red ⁿ	ASU/ml		% red ⁿ	ASU/ml		% red ⁿ
	applied	eff		applied	eff		applied	eff		applied	eff		applied	eff	
Dunnville	732	156	79	63	26	59	209	50	76	62	16	74	398	64	84
Union	3919	1503	62	196	107	45	466	147	68	78	143		3179	1106	65

TABLE X

CHEMICALS USED

PROJECT	CHLORINE 10 ³ lb.	SODIUM HYPOCHLORITE gallons	ALUM		SODIUM SILICATE 10 ³ lb.	SODIUM BICARBONATE 10 ³ lb.	POLYMER lb.	LIME Ca(OH) ₂ 10 ³ lb.	SODA ASH 10 ³ lb.	ACTIVATED CARBON 10 ³ lb.	SODIUM CHLORITE 10 ³ gal.	POT- PERMANG- lb.	D- E- 10 ³ lb.	SODIUM CHLORIDE 10 ³ lb.	FLUORIDE	
			LIQUID 10 ³ gal.	DRY 10 ³ lb.											H ₂ SiF ₆ gallons	Na ₂ SiF ₆ 10 ³ lb.
SURFACE WATER SUPPLIES																
Amherstburg	12.	360	16.		16.	3.8										7.2
Bancroft																
Beaverton	2.1															
Blenheim	3.1	240	8.0		12.	3.0										5.6
Bobcaygeon	0.78												14			
Cache Bay																
Chalk River	0.65															
Dresden	4.2			50.	31.	7.5		110				990				
Dunnville	40.															
Ear Falls		630														
Eganville		720		1.9												
Elgin Area W. S. S.	30.		32.													
Emo Twp.	1.1		2.1				49		10.							
Espanola	3.4															3.1
Fenelon Falls	1.3															
Geraldton	4.5															
Goderich	5.3		7.4		2.2	0.74										1.9
Halleybury	3.5		7.2		4.3	0.81		19.								
Hastings	Not Available															
Lake Huron W. S. S.	96.		150													
Lambton County W. S. S.	34.														83.	
Marmora	Not Available															
Meaford	3.7															
Moosonee		1040		40			560		23.						1.3	
Red Lake	3.9															
Rockland	7.7			12			1100	20.								
Southampton	1.4												32			
South Peel - Lakeview Plt.	140.		180.								95.				440.	
Union W. S. S.	51.		72.		21.	4.7				2.3						
Warkworth Twp.		640		4.9												
TOTAL USED	450	3630	475	109	86	21	1710	149	33	2.3	95.	990	46		536	5.0
NUMBER OF PLANTS	22	6	9	5	6	6	3	3	2	1	1	1	2		5	2
GROUND WATER SUPPLIES																
Alfred		480														
Blezard Valley	1.1															
Bradford		1253														
Brantford Twp.		166														
Chesterville		447														
Fauquier Twp.		375														
King Twp. - Schomberg														119		
Markham - Don Mills	2.7				56											
- John Street	5.6															
- Steeles Ave.	0.2															
- Pharmacy	3.7				41											
Newcastle		1825														
Port Perry		1091														
Thedford		118														
Vankleek Hill		278														
Wellington		41														
Winchester		800			.5											
Woodville		40														
Woolwich Twp.		228														
TOTAL USED	13.3	7142			97.5									119		
NUMBER OF PLANTS	5	13			3											

TABLE XI

FILTER OPERATION

PROJECT	TYPE OF FILTER	NUMBER and SIZE OF FILTERS	AVERAGE TURBIDITY		FILTER RUN		FILTER WASH
			FORMAZIN	UNITS	hours		WATER USED
		n x sq. ft.	APPLIED	FILTERED	AVERAGE	MINIMUM	% of output
<u>Surface Water Projects</u>							
Amherstburg	Gravity, dual media	4 x 416	3.5	.4	70	48	5
Beaverton	Pressure, sand	4 x 63					
Blenheim	Gravity, dual media	3 x 79		.7	12	7	6
Bobcaygeon	Vacuum, D. E.	1 x 180	2.6	.5			1
Eganville	Pressure, sand	2 x 38	1.8	.9	24	24	
Elgin Area W. S. S.	Gravity, dual media	2 x1040		.1	63	43	4
Emo Twp.	Gravity, multi-media	1 x 23		.7	5	4	8
Fenelon Falls	Pressure, sand	2 x 50	.6	.5	48	48	2
Goderich	Gravity, dual media	4 x 144	3.3	1.0	68	25	2
Haileybury	Gravity, dual media	3 x 140		2.0	71		2
Lake Huron W. S. S.	Gravity, dual media	12 x1100	12	.4	43		6
Marmora	Vacuum, D. E.	8 x 16					
Meaford	Gravity, anthracite	2 x 625	2.5	.8			5
Moosonee	Gravity, sand	2 x 28		1.5	20	16	2
Rockland	Gravity, dual media	2 x 113		.1			
Southampton	Pressure, D. E.	2 x 206	1.8	1.5			
South Peel - Lakeview	Gravity, dual media	18 x1000		.7	43	18	3
Union W. S. S.	Gravity, dual media	4 x 650	2.1	.8	53		2
Warkworth	Gravity, sand	1 x 35	3.0	1.5			
<u>Ground Water Projects (Iron Removal Plants)</u>							
Fauquier Twp.	Pressure, sand	2 x 13	4.3	.8			
Markham - John Street	Pressure	2 x					
Markham - Steeles Ave.	Gravity, sand						
Mitchell	Pressure, Anthracite	1 x 200	7.	1.0			
Richmond Hill - Oak Ridges	Pressure, Anthracite	4 x 33	16	.9			
Whitby Twp.	Pressure, sand	1 x 44	6.7	.3			
Woolwich Twp.	Pressure						

TABLE XII

WASTE STREAMS-CHARACTERISTICS

PROJECT	FILTER WASH WATER					SLUDGE FROM CLARIFIER/SETTLING BASIN				
	TOTAL VOLUME 10 ³ gallons	BOD mg/l	S·S· mg/l	TOTAL PHOSPHORUS mg/l P	KJELDAHL NITROGEN mg/l N	TOTAL VOLUME 10 ³ gallons	BOD mg/l	S·S· mg/l	TOTAL PHOSPHORUS mg/l P	KJELDAHL NITROGEN mg/l N
Amherstburg	17.33	5.2	355	.20		3.43	6.1	5670	4.0	
Bobcaygeon	.26	72.0	7020	6.3	106					
Dresden							3.7	8470	1.3	
Goderich	4.48	5.7	1300	1.3			220.0	81500	9.2	
Haileybury	2.62	4.9	537	.3						
Lake Huron	542.3	4.0	280							
Marmora	N/A	4.5	624	.46						
Moosonee	.63	6.0	560	.43						
Rockland		9.0	840	1.8	14.7		16.0	4313	6.1	49
South Peel - Lakeview	233.5	15.3	340	2.1			260		220	
Union	23.2	3.5	184	.4	1.0		8.8	1778	1.6	3
Warkworth		2.1	66	1.4						
Woolwich - St. Jacobs	.47	6.3	233	.9						

PLANT STAFF

Of the twenty three projects listed in Table XIII as being Ministry staffed, Amherstburg, Dunnville, Elgin Area WSS., Goderich, Haileybury, Lake Huron, Lambton WSS., South Peel WSS., and Union WSS., are supervised 24 hours per day. The others are supervised 8 hours per day or less. Chesterville, Ear Falls, Eganville, Emo Twp., Espanola, Frankford, Haileybury, Moosonee, Red Lake, Rockland, Westport, Woolwich Twp., and Winchester are operated in conjunction with other projects in the municipality or area. Total staff complement charged to the project is shown as a function of plant size in Graph No. 1 for all staffed projects listed in Table XIII.

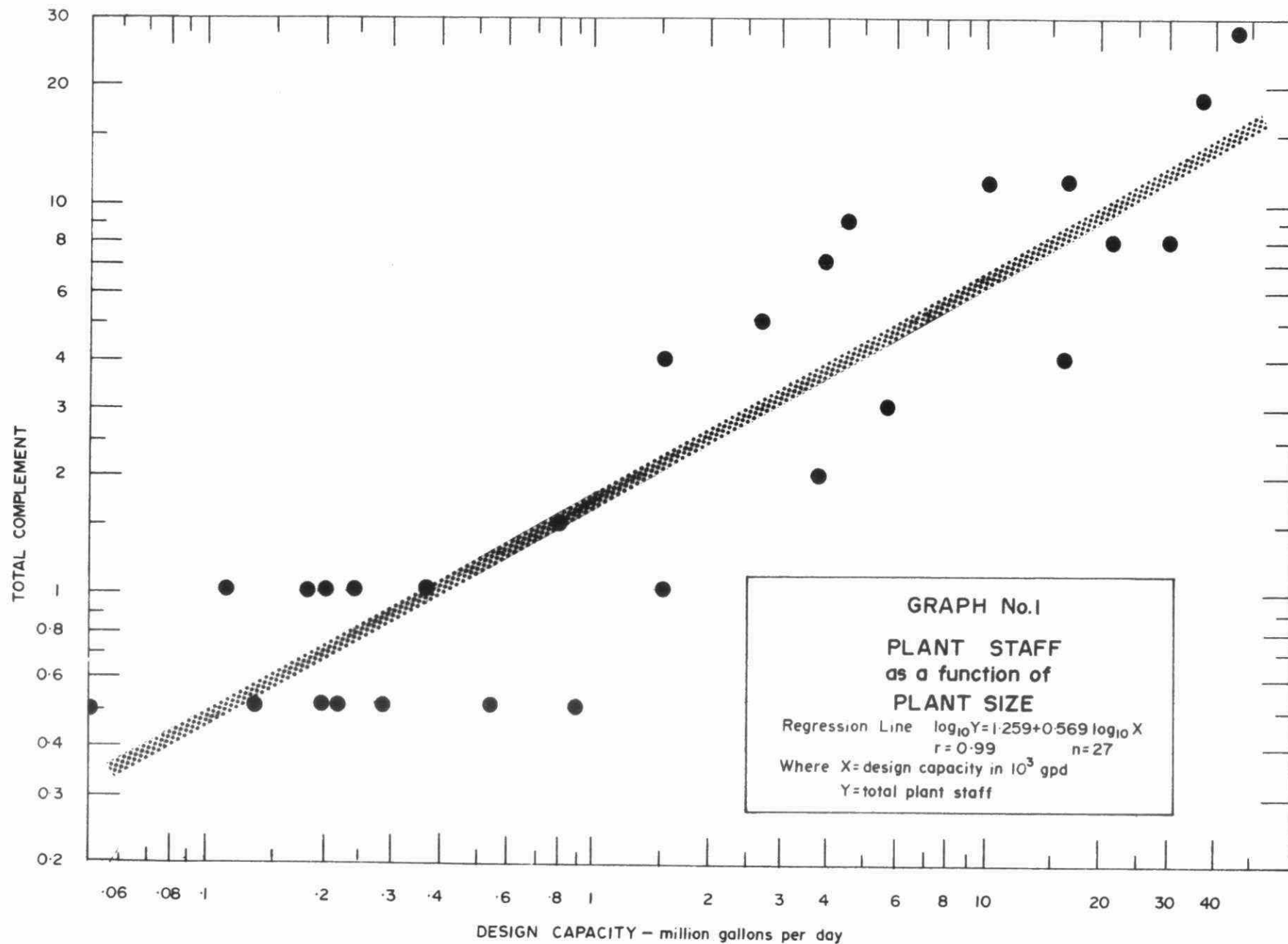


TABLE XIII

PLANT STAFF

PROJECT	SUPERINTENDENT	ASSISTANT SUPERINTENDANT	CHIEF OPERATOR	MECHANIC	ELECTRICIAN	CONTROLS TECHNICIAN	LABORATORY TECHNICIAN	OPERATOR	GRANDSMAN/ JANITOR	LABOURER	TOTAL
Amherstburg	1			1				5			7
Blenheim - Kent			1	1				2			4
Bleazard Valley			1		1						2
Bobcaygeon			1								1
Chesterville			0.5								0.5 a
Dunnville	1			2				5			8
Ear Falls			0.5								0.5 a
Eganville			0.5					0.5			1 a
Elgin Area	1			3				6		2	12
Emo Twp.			0.5								0.5 a
Espanola			0.5					0.5			1 a
Fenelon Falls			1								1
Frankford			0.5								0.5 b
Goderich			1					4			5
Haileybury	0.5							3.5			4 a
Lake Huron W. S. S.	1			2	1	1	1	11	1	1	19
Lambton County W. S. S.	1	1						6			8
Markham			1					2			3
Moosonee			0.5					0.5			1 a
Red Lake			0.5					0.5			1 a
Rockland			1					0.5			1.5 a
South Peel W. S. S.	1		1	5 c		2		16	2	2	29
Union W. S. S.	1	1		2				5	2		11
Wahnapitae (Sudbury)	1			1	1			6			9
Westport			0.5								0.5 a
Winchester			0.5								0.5 a
Woolwich Twp.			0.5								0.5 a

a Jointly operated with water pollution control plant

b Jointly operated with Trenton, Sidney Twp. and Frankford WPCP'S

c Includes Chief of Maintenance

OPERATING EXPENDITURES

The cost of operation of the water supply projects during 1973 are tabulated in Tables XIV and XV for surface water and ground water projects respectively. The cost of head office supervision, including travel, accounting, purchasing and inspection, is not charged against the projects.

An explanation of items included in each of the budget categories follows:

EXPLANATION

SALARIES & WAGES

Regular & Probationary	includes overtime, call-in, standby, etc.
Unclassified	includes casual, part-time

EMPLOYEE BENEFITS	includes employers share Canada Pension Plan, Superannuation, Unemployment Insurance, Workman's Compensation, etc.
-------------------	--

TRANSPORTATION & COMMUNICATION	includes travel, telephone, telemetering, accommodation, etc.
--------------------------------	---

SERVICES	includes easements, insurance, sludge haulage, maintenance and repair, leases.
----------	--

SUPPLIES & EQUIPMENT	includes new vehicles, chemicals, power, fuel, water, treatment chemicals, small tools, petty cash.
----------------------	---

ACQUISITION/CONSTRUCTION
OF PHYSICAL ASSETS

includes new sewer or water connections.

TRANSFER PAYMENTS

includes grants in lieu of taxes (provincial).

OTHER TRANSACTIONS

includes municipal taxes.

Unit costs are shown in Tables XIV and XV only for those plants for which the entire cost of operation is charged to the project. Many of the smaller projects are operated by municipal staff whose salaries are not included in the cost shown here.

Graph no. 2 relates the total cost of operation to plant size, considering two separate groups of plants: those providing "complete treatment and those providing microstraining only, iron removal or chemical treatment only. Graph no. 3 displays the relation of unit, cost of operation to plant size for the same two groups of plants.

TABLE XIV

OPERATING EXPENDITURES

SURFACE WATER SUPPLIES

NOTE: Units are dollars unless otherwise stated.

PROJECT	UNIT COST \$/1000 gallons	TOTAL EXPENDITURE	SALARIES AND WAGES	EMPLOYEE BENEFITS	TRANSPORTATION AND COMMUNICATIONS	SERVICES	SUPPLIES AND EQUIPMENT	ACQUISITION/ CONSTRUCTION OF PHYSICAL ASSETS	TRANSFER PAYMENTS	OTHER TRANSACTIONS
Amherstburg	36	124787	71343	4165	2439	3898	37714		5215	13
Bancroft		12				4	8			
Beaverton		40				40				
Blenheim	38	60530	40161	23050	1147	3098	13774			
Bobcaygeon	75	17526	11328	608	385	689	4516			
Cache Bay		373				3	370			
Chalk River		1916				19	1897			
Comber Twp.		2602	1912	17	323	157	144			49
Dresden		1870			24	15	1831			
Dunnville	4	165132	81532	4703	1315	10400	64031	5		3146
Ear Falls		18489	66		657	9830	6748		360	828
Eganville		2338			48	520	1770			
Elgin Area - Basic System		225012	104561	7099	3404	29787	79559		45	557
- Second System	18	30193	7205		195	4486	18070			237
- Tert System		9471	873		5	179	14			8400
- Port Burwell		9276	3312		560	1951	3449			4
- Port Burwell		4207	2381		71	434	1321			
Emo Twp.	118	17115	11446	569	581	663	3856			
Espanola	9	18502	9937	29	923	327	7286			
Fenelon Falls	41	23557	15795	568	963	801	5430			
Geraldton		17				17				
Goderich	20	80258	50596	2449	1741	453	14372			10647
Halleybury	39	58123	29338	1397	1932	3353	22103			
Harrow		2210			381	1553				276
Hastings		2817			215	461	2141			
Lake Huron - Water System	7	686829	181645	10326	4258	37485	436715		21	16379
- Ailsa Craig Vill.		139	900		30	939	(1730)			
- Bosanquet Twp.		4				4				
- Grand Bend		6392	1925			1178	3289			
- Ilderton Res-P. S.		2089	1098		38	202	751			
- Parkhill		994	144		43	25	153			629
- Parkhill		767	495		46	212	14			
Lambton County		136042	73721	4415	3143	4956	49788			19
Longlac										
Marmora		1275			17	4	1211			43
Meaford		18460				18447	13			
Michipicoten Twp.		66				24	42			
Moosonee	61	25904	9777	21	450	563	15093			
Red Lake		17357	8253	23	758	2091	6232			
Rockland	16	36173	17383	938	862	542	16446			
Southampton	8	11222			50	9994	1178			
South Peel	8	922928	325631	18059	6233	84924	472465		8684	6932
Union	11	193434	100045	5582	4041	5184	70656			
Warkworth	34	6196	3229	40	170	16	2741		68	7858
Watford, Wyoming & Plympton		32920	65		93	2156	30605			1

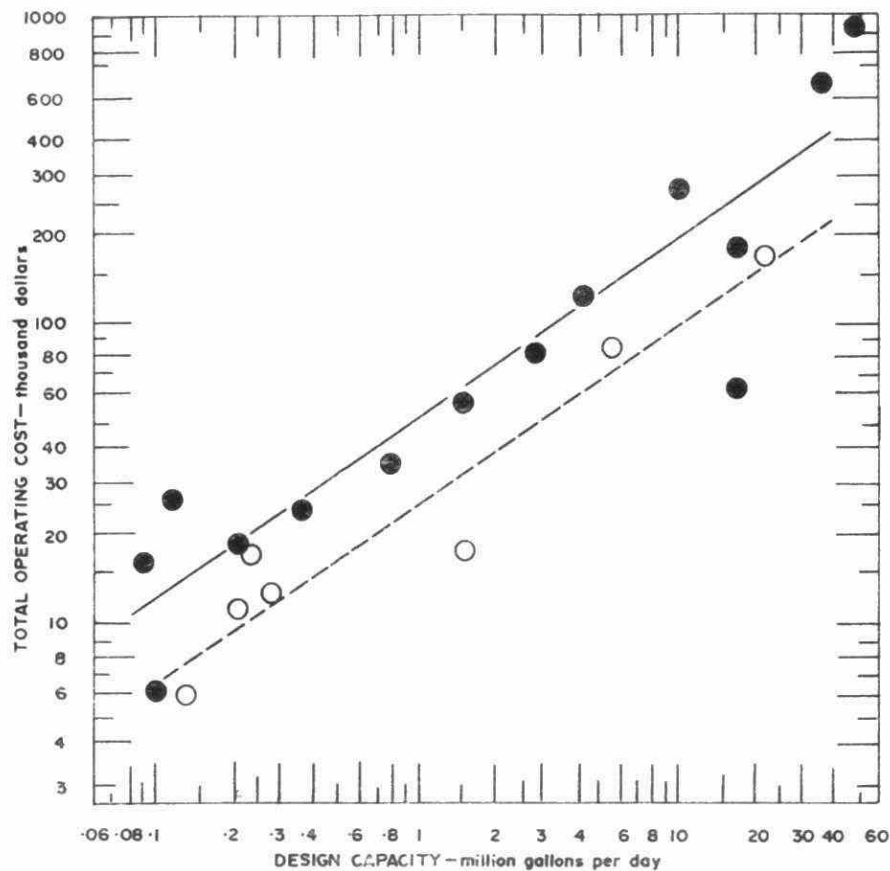
TABLE XV

OPERATING EXPENDITURES

GROUND WATER SUPPLIES

NOTE: Units are dollars unless otherwise stated.

PROJECT	UNIT COST \$/1000 gallons	TOTAL EXPENDITURE	SALARIES AND WAGES	EMPLOYEE BENEFITS	TRANSPORTATION AND COMMUNICATIONS	SERVICES	SUPPLIES AND EQUIPMENT	ACQUISITION/ CONSTRUCTION OF PHYSICAL ASSETS	TRANSFER PAYMENTS	OTHER TRANSACTIONS
Alfred		3205	349		177	192	2487			
Anson, Hindon & Minden	24	3842	2040	24		33	1745			
Blezard Valley		43198	17891	577	2515	1181	20996			38
Blind River		5957				458	5499			
Bolton		3740				1312	2428			
Bourget		116	73		41	2				
Bracebridge		10				10				
Bradford		7				13	(6)			
Brantford Twp.		5265			161	4	5100			
Brock Twp.		802				3	799			
Caledon East	19	4216	1439	8	20	4	2063			682
Chesterville	46	10606	1441			8144	1021			
Clarke Twp. (Orono)		1586			23	1192	371			
Cookstown		169			130	14	25			
Elmvale		1896				1864	32			
Fauquier	36	5436	1800	24	148	28	3436			
Frankford	5	2518	928			42	1020		268	260
Hanover		691				3	688			
Havelock		1427	331		33	65	998			
King Twp. (Schomberg)	37	6356	2493	32	139	26	3666			
Markham	9	83504	29078	1499	1549	8489	42889			
Mitchell		30				30				
Newcastle		731				3	728			
Orangeville		1884				46	1838			
Plantagenet		340	80		64	194	2			
Playfair Twp. (Ramore)		1129				7	1122			
Port Perry		3479				45	3434			
Preston										
Ratter & Dunnett	19	2233	1407	12		227	587			
Richmond Hill		480				22			154	304
Richmond Hill - Oak Ridges		4223				1062	3161			
Stayner		666				666				
Thedford	12	2197	126		122	46	1903			
Vankleek Hill	26	6267	3134	33	355	321	2424			
Wellington	54	11392	2788	47	84	6906	1567			
Whitby Twp.	14	3896	1789	18	89	27	1973			
Winchester	21	12768	1921			7200	3647			
Woodville		5250	4414	110	261	78	387			
Woolwich - St. Jacobs	77	15608	262	2	674	2166	6753			5755

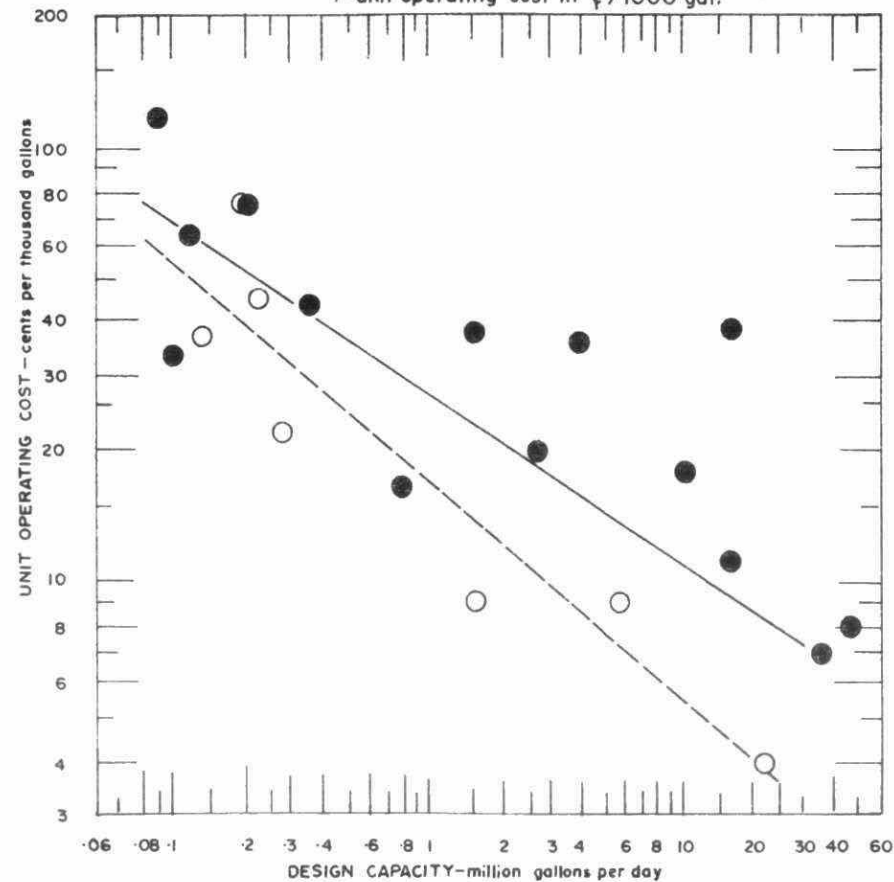


GRAPH No. 3 (below)
UNIT OPERATING COST vs PLANT SIZE

REGRESSION LINES

- "Complete" Treatment
 $\log_{10} Y = 1.517 - 0.295 \log X$
 $r = 0.78$ $n = 14$
- -○- - Iron removal, Microstraining or Chemical Treatment
 $\log_{10} Y = 1.24 - 0.505 \log X$
 $r = 0.92$ $n = 7$

Where X = design capacity in MGD
 Y = unit operating cost in ¢ / 1000 gal.



TD
209
W38
1974