



**Provincial Regulation 170/03  
Summary Report  
For the Period  
January 1 to December 31, 2004**

***Submitted to:***

***Guelph City Council***

***Prepared by: The City of Guelph***





# **GUELPH WATERWORKS DIVISION**

**Provincial Regulation 170/03  
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## **Contents**

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	<b>Page</b>
<b>Section 1 Executive Summary .....</b>	<b>4</b>
<b>Section 2 Introduction .....</b>	<b>7</b>
<b>Section 3 Water Treatment Summary .....</b>	<b>11</b>
<b>Section 4 Summary of Water Test Results .....</b>	<b>14</b>
<b>Section 5 Summary of Adverse Test Results and Corrective Actions .....</b>	<b>24</b>
<b>Section 6 Summary of Maintenance .....</b>	<b>28</b>
<b>Section 7 Compliance with Terms and Conditions of the Consolidated Certificate of Approval...</b>	<b>31</b>
<b>Section 8 Non-Compliance with Terms and Conditions of the Certificate of Approval and Regulations .....</b>	<b>36</b>
<b>Section 9 Summary of Sodium Analytical Results .....</b>	<b>38</b>
<b>Section 10 Summary of Quantity of Water Supplied .....</b>	<b>40</b>
 <b>Appendix A Consolidated Certificate of Approval .....</b>	 <b>47</b>

## **List of Tables and Figures**

---

<b>Figure A 2004 Active Water Supply Facilities.....</b>	<b>9</b>
<b>Figure B Eight Year Trend of Total Annual Water Pumpage .....</b>	<b>40</b>
 <b>Table A 2004 Sodium Hypochlorite Usage and Chlorine Dosage.....</b>	 <b>11</b>
<b>Table B 2004 Sodium Silicate Usage and Dosage.....</b>	<b>12</b>
<b>Table C 2004 Water Supply Bacteriological Results Summary.....</b>	<b>15</b>
<b>Table D 2004 Water Distribution Bacteriological Results Summary .....</b>	<b>16</b>
<b>Table E 2004 Water Supply &amp; Distribution Process Parameter Results Summary.....</b>	<b>17</b>
<b>Table F 2004 Reg. 170/03 Schedule 23 Results Summary .....</b>	<b>18</b>
<b>Table G 2004 Reg. 170/03 Schedule 24 Results Summary.....</b>	<b>19</b>
<b>Table H 2004 Miscellaneous Test Results Summary .....</b>	<b>22</b>
<b>Table I 2004 Summary of Adverse Test Results and Corrective Actions .....</b>	<b>24</b>
<b>Table J 2004 Customer Water Quality Complaints .....</b>	<b>32</b>
<b>Table K 2004 Sodium Analytical Results.....</b>	<b>38</b>
<b>Table L 2004 Pumpage Summary.....</b>	<b>41</b>
<b>Table M 2004 Monthly Average Daily Pumpage in Cubic Metres Per Day .....</b>	<b>44</b>





# **SECTION 1 EXECUTIVE SUMMARY**





## **Section 1 Executive Summary**

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This report is submitted to satisfy Schedule 22 of Ontario Regulation 170/03 (O.Reg. 170/03, Schedule 22) requirement to prepare and distribute a Summary report. According to this regulation, the Summary report must contain the following information:

- List the requirements of the Safe Drinking Water Act, the regulations, the system's approval and any order that the system failed to meet at any time during the period covered by the report and specify the duration of the failure;
- For each failure, describe the measures that were taken to correct the failure;
- A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows, and daily instantaneous peak flow rates; and
- A comparison of the actual flows to the rated capacity and flow rates approved in the system's approval.

Section 2 of this report contains a brief description of the drinking-water system.

In 2004, all water was treated consistent with Ontario Ministry of the Environment (MOE) standards using approved treatment chemicals – specifically sodium hypochlorite and sodium silicate.

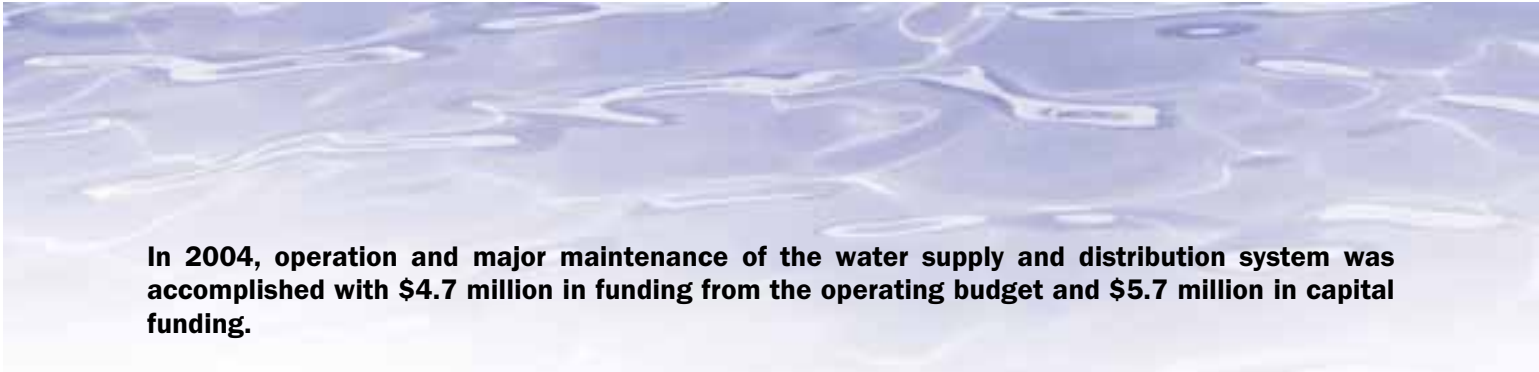
In 2004, over 18,000 microbiological and chemical quality tests were performed on water supplied by Guelph Waterworks. All samples were collected by certified Waterworks operators following industry standard protocols. Analyses were performed by these same operators and by accredited independent laboratories on water samples collected throughout the water system (supply and distribution).

In 2004, all water supplied to consumers met or bettered all health-related Ontario Drinking Water Standards.

Of the 5,641 bacteriological analyses performed on treated water, nine samples or 0.2 percent indicated the presence of adverse indicator bacteria or high general bacteria counts. The indicator bacteria are not disease causing but show potential for a bacterial problem. None of these incidents, when resampled, confirmed any water quality deterioration. At no time was *E. coli* detected in Guelph's drinking water.

Of the 10,522 chemical analyses performed, only five samples or 0.05 percent indicated the presence of chemicals above regulatory health guidelines. Mandatory retesting confirmed in all instances that the water supplied met regulatory requirements.

In 2004, Waterworks operated and maintained the water supply, treatment, and distribution system in such a manner that water supplied to all consumers serviced by the system met the requirements of the Safe Drinking Water Act, 2002. All management, operation, and maintenance duties were performed by certified, adequately trained supervisors and operators.



**In 2004, operation and major maintenance of the water supply and distribution system was accomplished with \$4.7 million in funding from the operating budget and \$5.7 million in capital funding.**

**In 2004, Waterworks complied fully with the requirements of the Safe Drinking Water Act, the Drinking-Water Systems Regulation 170/03, and the Consolidated Certificate of Approval.**

**Copies of the Provincial Regulation 170/03 Summary Report for the Period January 1 to December 31, 2004 can be obtained at the following locations:**

- **Woods Station, 29 Waterworks Place (837-5627);**
- **The main branch of the Guelph Public Library;**
- **The Environment and Transportation Group administrative office located at 2 Wyndham Street, 3<sup>rd</sup> floor; and**
- **Electronically on the City's website, [www.guelph.ca](http://www.guelph.ca).**





**SECTION 2**  
**INTRODUCTION**





## **Section 2 Introduction**

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The mission of the City of Guelph Waterworks Division is to provide customers and the community with valued service through responsible water resource management. Waterworks provides and promotes reliable, cost effective systems for the safe production and delivery of consistently high quality water.

Guelph Waterworks is a municipally owned and operated water utility first established in 1879. The source of Guelph's drinking water is a series of 23 groundwater wells and a shallow groundwater collector system. Guelph's water supply and distribution system is comprised of the following infrastructure:

- 6 kilometres of 1,067 mm diameter water supply aqueduct;
- 5 underground storage reservoirs with a combined capacity of 48,000 cubic metres;
- 3 water towers with a combined capacity of 11,300 cubic metres;
- 570 kilometres of buried water main ranging in diameter from 100 mm to 900 mm;
- 3,252 watermain valves;
- 2,210 fire hydrants; and
- 34,065 water services and water meters.

The replacement cost of the entire system is estimated to be \$327 million (uninflated) or \$3,000 per capita. The 2004 Operating Budget contained expenditures totalling \$11.9 million. All Waterworks operations and capital projects are funded directly from the sale of water.

In 2004, a total of 18.7 million cubic metres of water was pumped and treated. Lost water totalled approximately 12 percent of all water pumped. The average daily water demand was 51,229 cubic metres. The highest daily use of water occurred on June 8 when 60,103 cubic metres of water was pumped. This is 8 percent lower than the maximum pumpage day of 2003.

In 2004, over 18,000 microbiological and chemical quality tests were performed by certified operators and accredited, licensed laboratories on water samples collected throughout the water system. In all cases, the drinking water supplied to all customers was safe and better than all Ontario and Canadian health-related guidelines.


### **Regulatory Changes**

In response to an outbreak of *Escherichia (E.coli):O157* in Walkerton, the Ontario Provincial Ministry of the Environment (MOE) announced Operation Clean Water and enacted the Safe Drinking Water Act (the Act) in 2002. The Act prescribes strict, mandatory requirements for testing and treatment of all municipal drinking water, and actions necessary when standards are not met. The regulation also identifies accountability for drinking water safety and supports the consumer's right to timely and accurate reporting of water quality information.

The Act has impacted Guelph Waterworks and its customers in the following ways:





- 
- **Previously, Waterworks relied on regular bacteriological testing to determine the chlorine levels required for disinfection of our various groundwater supplies. Minimum, prescribed levels of chlorine must now be added to all water supplies and maintained in all water distributed to customers. Customers have noticed and commented on the increased chlorine taste and odour in Guelph's water. Waterworks is working with the Ministry of the Environment to minimize chlorine use;**
  - **The additional chlorine in Guelph's water is reacting with natural iron and manganese in the groundwater to create more frequent episodes of discoloured water for customers. Waterworks has increased watermain cleaning activities to limit these incidents and is planning water treatment upgrades to remove these minerals from our well supplies;**
  - **Additional sampling and testing, and the generation of both this Summary Report and an Annual report are required by the legislation;**
  - **All water systems must follow minimum disinfection standards. This involves upgrades to system infrastructure including chemical systems, control and monitoring systems, and storage reservoirs;**
  - **System upgrades have resulted in decreased system capacity in the short term as existing supplies undergo treatment upgrades to comply with new legislation; and**
  - **Schedule 22 of Regulation 170/03 requires Waterworks to produce and distribute this annual Summary Report. Copies will be available for customers at both Woods Station at 29 Waterworks Place, and at the Environment & Transportation Group offices located on the 3<sup>rd</sup> floor of 2 Wyndham Street. An electronic copy of the report will also be available on the City's web site at [www.guelph.ca](http://www.guelph.ca).**

**Water rates have been increased significantly to pay for these activities and upgrades with the goal of providing a more secure water supply.**

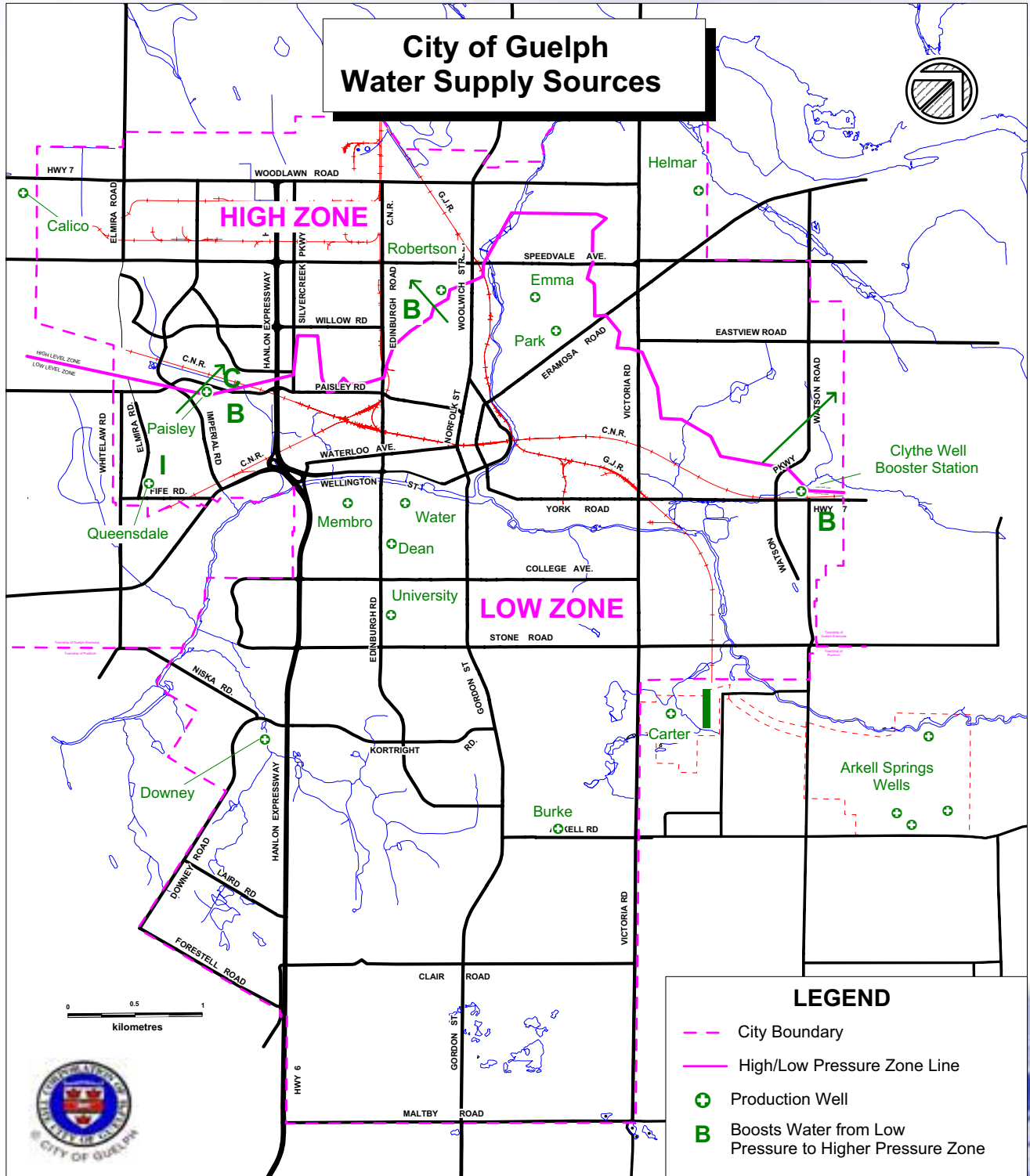
**On September 10, 2004 the MOE issued Guelph's latest Consolidated Certificate of Approval (CC of A). The CC of A acts as a license for water supply and distribution operations and sets out a schedule of mandatory facility upgrades to comply with the Act. Currently 4 of our 23 water supply facilities require major disinfection and treatment upgrades.**

**The Guelph water system is currently licensed as a MOE Class II Water Treatment system and MOE Class III Water Distribution system. Currently 22 water supply and distribution operators and 3 supervisors are licensed to operate and maintain the water system.**

**Figure A shows the locations of water supply facilities that were active in 2004.**



**Figure A 2004 Active Water Supply Facilities**





**SECTION 3**  
**WATER TREATMENT SUMMARY**



## Section 3 Water Treatment Summary

This section describes the type and amount of drinking water treatment chemicals used in 2004.

In 2004, chlorine in the form of a 12 percent sodium hypochlorite solution was added to disinfect all water supplied to consumers. Liquid sodium silicate was also added to all water supplied from the Helmar and Queensdale wells to control high levels of naturally occurring iron and manganese. Through the act of sequestration, sodium silicate prevents this iron and manganese from precipitating when the water is treated and thereby prevents discoloured water.

In 2004, there were no periods of abnormal use of sodium hypochlorite or sodium silicate.

Tables A and B below summarize sodium hypochlorite and sodium silicate use at each supply facility in 2004.

**Table A 2004 Sodium Hypochlorite Usage and Chlorine Dosage**

<b>FACILITY</b>	<b>SODIUM HYPOCHLORITE kg/Day<sup>a</sup></b>	<b>WATER PRODUCED Cubic Metres/Day<sup>a</sup></b>	<b>CHLORINE DOSE mg/L<sup>a</sup></b>	<b>PURPOSE</b>
Woods	363.9	26,623	1.6	Well water disinfection
Helmar	40.6	1,016	4.8	Well water disinfection
Park	57.9	4,573	1.5	Well water disinfection
Burke	74.7	5,567	1.6	Well water disinfection
Downey	58.5	4,281	1.6	Well water disinfection
Membro	45.7	3,631	1.5	Well water disinfection
Queensdale	34.8	1,215	3.4	Well water disinfection
Water	23.1	1,583	1.8	Well water disinfection
Dean	15.2	1,269	1.4	Well water disinfection
University	23.1	1,739	1.6	Well water disinfection
Calico	14.1	887	1.9	Well water disinfection
Emma	44.3	2,429	2.1	Well water disinfection
Clythe	0 <sup>b</sup>	3,496	0 <sup>b</sup>	Rechlorination
Robertson	0 <sup>b</sup>	3,185	0 <sup>b</sup>	Rechlorination
Paisley	34.0	6,690	0.6	Rechlorination & well water disinfection

mg/L - milligrams per litre. Equivalent to parts per million.

<sup>a</sup> Average based on days in operation.

<sup>b</sup> Rechlorination system operable, but no active due to high chlorine content of inlet water.

**Table B 2004 Sodium Silicate Usage and Dosage**

<b>FACILITY</b>	<b>SODIUM SILICATE kg/Day<sup>a</sup></b>	<b>WATER PRODUCED Cubic Metres/Day<sup>a</sup></b>	<b>SILICATE DOSE mg/L<sup>a</sup></b>	<b>PURPOSE</b>
<b>Helmar</b>	<b>13.0<sup>b</sup></b>	<b>1,016</b>	<b>3.5</b>	<b>Iron control</b>
<b>Queensdale</b>	<b>15.3<sup>b</sup></b>	<b>1,215</b>	<b>3.6</b>	<b>Iron control</b>

mg/L - milligrams per litre. Equivalent to parts per million.

<sup>a</sup> Average based on days in operation

<sup>b</sup> Chemical use increased to ensure effective treatment





## **SECTION 4 SUMMARY OF WATER TEST RESULTS**



## **Section 4 Summary of Water Test Results**

**This section summarizes water quality test results required by the Ontario Drinking-Water System Regulation 170/03 for the period January to December 2004.**

**In 2004, all water supplied to consumers met or bettered all health-related Ontario Drinking Water Standards. Of the 5,641 bacteriological analyses performed on treated water, nine samples or 0.2 percent showed the presence of adverse indicator bacteria or high general bacteria counts. The indicator bacteria are not disease causing but show potential for a bacterial problem. None of these incidents, when resampled, confirmed water quality deterioration. At no time was E. coli detected in Guelph's drinking water.**

**Of the 10,522 chemical analyses performed on treated water, five samples or 0.05 percent indicated the presence of chemicals above regulatory health guidelines. Mandatory retesting confirmed in all instances that the water supplied met regulatory requirements.**

**The following Tables C through H provide a summary of 2004 laboratory and process parameter results.**



**Table C 2004 Water Supply Bacteriological Results Summary**

<b>Parameter</b>	<b>O.D.W.S.</b>	<b>Total Samples</b>	<b>Adverse Samples</b>	<b>Percent Adverse</b>	<b>Range</b>	<b>Average</b>	<b>Typical Source of Contaminant</b>
<b>Total Coliform count/100 mL</b>	*	661	0	0	N/A	N/A	<b>Indicates possible presence of fecal matter</b>
<b>E. Coli count/100 mL</b>	*	661	0	0	N/A	N/A	<b>Definite indicator of fecal matter</b>
<b>Heterotrophic Plate Count count/100 mL</b>	500	650	0	0	0-1,200	5.46	<b>Indicator of water quality deterioration</b>
<b>Raw Water Bacti Tests</b>	N/A	1,045 <sup>a</sup>	0	0	N/A	N/A	<b>Indicator of Environmental Water Quality</b>
<b>O.D.W.S. – Regulation 169/03 Ontario Drinking Water Standards</b> <b>N/A – Not Applicable</b> <b>mL - Millilitre</b> <sup>a</sup> – includes total coliform and e-coli * Indicator of Adverse Water Quality if Detected in Treated Water							





**Table D 2004 Water Distribution Bacteriological Results Summary**

<b>Parameter</b>	<b>O.D.W.S.</b>	<b>Total Samples</b>	<b>Adverse Samples</b>	<b>Percent Adverse</b>	<b>Range</b>	<b>Average</b>	<b>Typical Source of Contaminant</b>
<b>Total Coliform count/100 mL</b>	*	1,460	0	0	N/A	N/A	<b>Indicates possible presence of fecal matter</b>
<b>E. Coli count/100 mL</b>	*	1,463	0	0	N/A	N/A	<b>Definite indicator of fecal matter</b>
<b>Heterotrophic Plate Count count/mL</b>	500	746	0	0	0-1,500	22.4	<b>Indicator of water quality deterioration</b>
<b>O.D.W.S. – Regulation 169/03 Ontario Drinking Water Standards</b> <b>N/A – Not Applicable</b> <b>mL - Millilitre</b> <b>* Indicator of Adverse Water Quality if Detected in Treated Water</b>							



**Table E 2004 Water Supply & Distribution Process Parameter Results Summary**

<b>Parameter</b>	<b>O.D.W.S.</b>	<b>Total Samples</b>	<b>Adverse Samples</b>	<b>Average</b>	<b>Range</b>	<b>Health Exceedance</b>	<b>Typical Source of Contaminant</b>
<b>Turbidity in Supply (NTU)</b>	<b>5</b>	<b>1,274</b>	<b>0</b>	<b>0.168</b>	<b>0.04-0.60</b>	<b>NO</b>	<b>Indicator of particles in water</b>
<b>Free Chlorine in Supply (mg/L)</b>	<b>4</b>	<b>5,644</b>	<b>0</b>	<b>0.775</b>	<b>0.13-2.00</b>	<b>NO</b>	<b>MOE recommends 0.2 mg/L to maintain microbiological quality</b>
<b>Free Chlorine in Distribution (mg/L)</b>	<b>4</b>	<b>1,965</b>	<b>0</b>	<b>0.623</b>	<b>0.21-1.30</b>	<b>NO</b>	<b>MOE recommends 0.2 mg/L to maintain microbiological quality</b>

**O.D.W.S. – Regulation 169/03 Ontario Drinking Water Standards  
 NTU – Nephelometric Turbidity Units  
 mg/L – milligrams per litre. Equivalent to parts per million**



**Table F 2004 Reg. 170/03 Schedule 23 Results Summary**

<b>Parameter</b>	<b>ODWS mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>	<b>Typical Source of Contaminant</b>
Antimony	0.006	15	5	0.0009	0.0005 – 0.0013	NO	Natural Component of Water
Arsenic	0.025	15	1	0.003	0.003	NO	Natural Component of Water
Barium	1	15	15	0.028	0.028 – 0.08	NO	Natural Component of Water
Boron	5	15	15	0.029	0.009- 0.067	NO	Natural Component of Water
Cadmium	0.005	15	3	0.0001	0.0001	NO	Natural Component of water
Chromium	0.05	15	0	0.005	0.005	NO	Natural Component of water
Mercury	0.001	15	0	0.0001	0.0001	NO	Rare in Groundwater
Selenium	0.01	15	0	0.002	0.002	NO	Natural Component of Water
Uranium	0.1	15	14	0.0013	0.0001- 0.0027	NO	Natural Component of Water

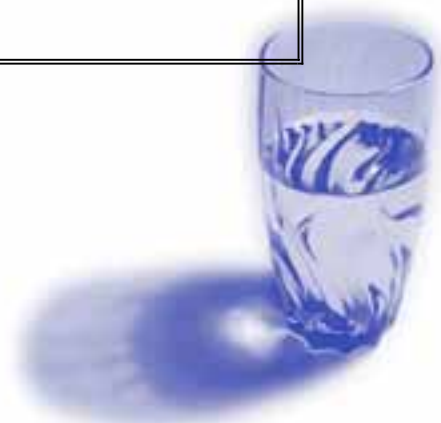
O.D.W.S. – Regulation 169/03 Ontario Drinking Water Standards  
mg/L - milligrams per litre. Equivalent to parts per million



**Table G 2004 Reg. 170/03 Schedule 24 Results Summary**

<b>Parameters</b>	<b>O.D.W.S. mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>
Alachlor	0.005	15	0	ND	N/A	NO
Aldicarb	0.009	15	0	ND	N/A	NO
Aldrin + Dieldrin	0.0007	15	0	ND	N/A	NO
Atrazine + N-dealkylated metabolites	0.005	15	0	ND	N/A	NO
Azinphos -methyl	0.02	15	0	ND	N/A	NO
Bendiocarb	0.04	15	0	ND	N/A	NO
Benzene	0.005	62	0	ND	N/A	NO
Benzo(a)pyrene	0.00001	17	0	ND	N/A	NO
Bromoxynil	0.005	15	0	ND	N/A	NO
Carbaryl	0.09	15	0	ND	N/A	NO
Carbofuran	0.09	15	0	ND	N/A	NO
Carbon Tetrachloride	0.005	62	0	ND	N/A	NO
Chlordane (Total)	0.007	15	0	ND	N/A	NO
Chlorpyrifos	0.09	15	0	ND	N/A	NO
Cyanazine	0.01	15	0	ND	N/A	NO
Diazinon	0.02	15	0	ND	N/A	NO
Dicamba	0.12	15	0	ND	N/A	NO
1,2-Dichlorobenzene	0.2	62	0	ND	N/A	NO
1,4-Dichlorobenzene	0.005	62	0	ND	N/A	NO
DDT + metabolites	0.03	15	0	ND	N/A	NO
1,2-Dichloroethane	0.005	62	0	ND	N/A	NO
1,1-Dichloroethylene (Vinylidene Chloride)	0.014	62	0	ND	N/A	NO
Dichloromethane	0.05	62	0	ND	N/A	NO
2,4-Dichlorophenol	0.9	15	0	ND	N/A	NO
2,4- Dichlorophenoxyacetic acid	0.1	15	0	ND	N/A	NO

**O.D.W.S. - Regulation 160/03 Ontario Drinking Water Standards  
mg/L - milligrams per litre. Equivalent to parts per million.**



**Table G 2004 Reg. 170/03 Schedule 24 Results Summary Continued**

<b>Parameters</b>	<b>O.D.W.S. mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>
Diclofop-methyl	0.009	15	0	ND	N/A	NO
Dimethoate	0.02	15	0	ND	N/A	NO
Dinoseb	0.01	15	0	ND	N/A	NO
Diquat	0.07	15	0	ND	N/A	NO
Diuron	0.15	15	0	ND	N/A	NO
Glyphosate	0.28	15	0	ND	N/A	NO
Heptachlor + Heptachlor Epoxide	0.003	15	0	ND	N/A	NO
Lindane (Total)	0.004	15	0	ND	N/A	NO
Malathion	0.19	15	0	ND	N/A	NO
Methoxychlor	0.9	15	0	ND	N/A	NO
Metolachlor	0.05	15	0	ND	N/A	NO
Metribuzin	0.08	15	0	ND	N/A	NO
Monochlorobenzene	0.08	62	0	ND	N/A	NO
Paraquat	0.01	15	0	ND	N/A	NO
Parathion	0.05	15	0	ND	N/A	NO
Pentachlorophenol	0.06	15	0	ND	N/A	NO
Phorate	0.002	15	0	ND	N/A	NO
Picloram	0.19	15	0	ND	N/A	NO
Polychlorinated Biphenyls (PCB)	0.003	15	0	ND	N/A	NO

O.D.W.S. - Regulation 160/03 Ontario Drinking Water Standards  
mg/L - milligrams per litre. Equivalent to parts per million.



**Table G 2004 Reg. 170/03 Schedule 24 Results Summary Continued**

<b>Parameters</b>	<b>O.D.W.S. mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>
Prometryne	0.001	15	0	ND	N/A	NO
Simazine	0.01	15	0	ND	N/A	NO
Temephos	0.28	15	0	ND	N/A	NO
Terbufos	0.001	15	0	ND	N/A	NO
Tetrachloroethylene (perchloroethylene)	0.03	62	5	0.0004	0.0001 - 0.0004	NO
2,3,4,6- Tetrachlorophenol	0.1	15	0	ND	N/A	NO
Triallate	0.23	15	0	ND	N/A	NO
Trichloroethylene	0.05	62	24	0.0010	0.0001 - 0.0029	NO
2,4,6-Trichlorophenol	0.005	15	0	ND	N/A	NO
2,4,5- Trichlorophenoxyacetic acid	0.28	15	0	ND	N/A	NO
Trifluralin	0.045	15	0	ND	N/A	NO
Vinyl Chloride	0.002	62	0	ND	N/A	NO

O.D.W.S. – Regulation 169/03 Ontario Drinking Water Standards  
mg/L - milligrams per litre. Equivalent to parts per million.



**Table H 2004 Miscellaneous Test Results Summary**

<b>Parameters</b>	<b>O.D.W.S. mg/L</b>	<b>Total Samples</b>	<b>Samples Above Detection</b>	<b>Average mg/L</b>	<b>Range mg/L</b>	<b>Health Exceedance</b>
<b>Nitrate<sup>a</sup></b>	<b>10</b>	<b>60</b>	<b>48</b>	<b>1.6</b>	<b>0.2 -4.2</b>	<b>NO</b>
<b>Nitrite<sup>a</sup></b>	<b>1.0</b>	<b>60</b>	<b>0</b>	<b>ND</b>	<b>N/A</b>	<b>NO</b>
<b>Lead in Distribution Samples</b>	<b>0.01</b>	<b>2</b>	<b>1</b>	<b>0.0032</b>	<b>0.0005 - 0.0032</b>	<b>NO</b>
<b>Trihalomethanes in Distribution Samples</b>	<b>0.1</b>	<b>9</b>	<b>9</b>	<b>0.0303</b>	<b>0.018 - 0.061</b>	<b>NO</b>
<b>Sodium</b>	<b>N/A</b>	<b>16</b>	<b>16</b>	<b>47.7</b>	<b>14.9 - 93.3</b>	<b>NO</b>
<b>Fluoride</b>	<b>1.5</b>	<b>15</b>	<b>15</b>	<b>0.3</b>	<b>0.1 - 0.8</b>	<b>NO</b>
<b>O.D.W.S. - Regulation 169/03 Ontario Drinking Water Standards                      mg/L - milligrams per litre. Equivalent to parts per million.  <sup>a</sup> - Based on treated samples</b>						





**SECTION 5**  
**SUMMARY OF ADVERSE TEST RESULTS AND CORRECTIVE**  
**ACTIONS**





## Section 5 Summary of Adverse Test Results and Corrective Actions

This section summarizes adverse water quality test results and incidents, and corresponding corrective actions taken for the period January to December 2004.

Schedule 16 of the Drinking-Water Systems Regulation 170/03 prescribes the reporting procedures that must immediately be followed when adverse water quality is observed or detected during routine testing. Waterworks contract laboratories must notify the MOE, the Wellington-Dufferin-Guelph Health Unit (Health Unit), and the Waterworks Supervisor of the adverse result by phone. The Waterworks Supervisor must then again notify, both by phone and in writing, the MOE and Health Unit of the adverse result and the conditions of operation at the time of sampling. If applicable, the Supervisor will then implement corrective actions such as resampling, increasing the chlorine dose, isolating a source, or flushing the system. Waterworks must then report the results of the corrective actions taken to both the MOE and Health Unit within seven days of the issue resolution.

When an adverse bacteriological or chemical result is detected, the first action required under Schedule 17 of Regulation 170/03 is the resampling and testing of the source with the adverse result. It is the nature of both microbiological and chemical analysis to occasionally have false-positive results. If additional adverse results are not detected, then routine monitoring resumes.

**Table I 2004 Summary of Adverse Test Results and Corrective Actions**

#	Date	Location	Description	Corrective Action	Resample Results Good
1	2004/01/21	Waverly Dr/Balmoral Dr.	Main Break	Local Boil Water Advisory issued - bottled water provided - Health Unit and MOE Notified - system flushed - disinfected and resampled	Yes
2	2004/02/19	Edinburgh Station Point of Entry	1200 cfu HPC (Max ODWS = 500 cfu)	Health Unit and MOE notified - resampled	Yes
3	2004/04/18	551 Clair Rd. W.	1200 cfu HPC (Max ODWS = 500 cfu)	Health Unit and MOE notified - resampled	Yes

HPC – Heterotrophic Plate Count: An indicator of general bacterial quality. HPC is measured in colony forming units per millilitre (cfu/mL). CFU – colony forming units, ppb – parts per billion, NTU – nephelometric turbidity units, mg/L milligrams per litre  
O.D.W.S. – Regulation 169 Ontario Drinking Water Standards

**Table I 2004 Summary of Adverse Test Results and Corrective Actions  
Continued**

<b>#</b>	<b>Date</b>	<b>Location</b>	<b>Description</b>	<b>Corrective Action</b>	<b>Resample Results Good</b>
4	2004/05/11	New (not commissioned or used) watermain	1 Total Coliform (Max ODWS = 0 cfu)	Health Unit and MOE notified - new watermain drained, re-chlorinated and re-sampled	Yes
5	2004/06/04	Gazer Mooney - Sewage Lift Station	860 cfu HPC (Max ODWS = 500 cfu)	Health Unit and MOE notified - resampled	Yes
6	2004/06/08	Verney Water Tower	1 Total Coliform ( Max ODWS = 0 cfu)	Health Unit and MOE notified - resampled	Yes
7	2004/06/09	Robertson Station	>1500 cfu HPC (Max ODWS = 500 cfu)	Health Unit and MOE notified - resampled	Yes
8	2004/06/25	Robertson Station	Sodium 64.5 mg/L (Max ODWS = 200mg/L - notification required at 20mg/L)	Health Unit and MOE notified - resampled	n/a
9	2004/06/30	Robertson Station	Lead 0.0149 mg/L (Max ODWS= 0.01 mg/L)	Health Unit and MOE notified - resampled	Yes
10	2004/07/06	Helmar Station	Benzo[a]Pyrene 0.030 ug/L (Max ODWS = 0.010 mg/L)	Health Unit and MOE notified - resampled	Yes
11	2004/09/03	Clair Tower	1 Total Coliform (Max ODWS = 0 cfu)	Health Unit and MOE notified - resampled	Yes
12	2004/09/14	Membro Station	1 Total Coliform ( Max ODWS= 0 cfu)	Health Unit and MOE notified - resampled	Yes

HPC – Heterotrophic Plate Count: An indicator of general bacterial quality. HPC is measured in colony forming units per millilitre (cfu/mL). CFU – colony forming units, ppb – parts per billion, NTU – nephelometric turbidity units, mg/L milligrams per litre  
O.D.W.S. – Regulation 169 Ontario Drinking Water Standards



**Table I 2004 Summary of Adverse Test Results and Corrective Actions  
Continued**

<b>#</b>	<b>Date</b>	<b>Location</b>	<b>Description</b>	<b>Corrective Action</b>	<b>Resample Results Good</b>
13	2004/09/17	544 Wellington Street	770 cfu HPC (Max = 500 cfu)	Health Unit and MOE notified - resampled	Yes
14	2004/10/20	Burkes Station	Turbidity 1.4 NTU (no regulated max)	Station reservoir cleaned and resampled for turbidity	Yes
15	2004/12/23	Membro Station	Acetone 18.5 ppb (not regulated)	Health Unit and MOE notified - resampled	Yes
<p>HPC – Heterotrophic Plate Count: An indicator of general bacterial quality. HPC is measured in colony forming units per millilitre (cfu/mL). CFU – colony forming units, ppb – parts per billion, NTU – nephelometric turbidity units, mg/L milligrams per litre                      O.D.W.S. – Regulation 169 Ontario Drinking Water Standards</p>					





**SECTION 6  
SUMMARY OF MAINTENANCE**





## **Section 6 Summary of Maintenance**

This section summarizes the 2004 major operating and capital expenses incurred to maintain the water supply and distribution system.

The Waterworks Division of the Environmental Services Department is responsible for the supply and distribution of potable water to the citizens of Guelph. Water quality objectives established by the MOE are achieved through a combination of groundwater protection initiatives, disinfection of water from 23 groundwater wells and the maintenance of a distribution network consisting of almost 550 km of watermain. All Waterworks revenue is derived directly from the sale of water to customers.

The water programs and services described below contribute to the Waterworks and Wastewater vision:

“We will be a recognized leader in municipal water management, moving forward consistently at the forefront of our industry and setting a standard for others to follow.”

### **Regulatory Compliance**

In February 2002, the Ministry of the Environment (MOE) issued a Consolidated Certificate of Approval (CCofA) to Waterworks based on the findings of the *2001 Engineers Report*. The CCofA outlines the following requirements that have direct budgetary impact:

#### **A) Completion of Disinfection Upgrades by June 2006**

Disinfection upgrades are required at nine facilities with four facilities complete, four underway, and one to be initiated in 2005. Funding for these upgrades is split equally between the municipality, province and federal government with the City portion forecast at approximately \$4 million.

#### **B) Completion of Groundwater Under the Direct Influence of Surface Water (GUDI) Compliance Treatment Study and Potential Treatment Upgrades**

In July of 2002, the City completed and submitted for MOE review a GUDI study of five water sources. In September 2004, a revised CC of A was received listing additional treatment upgrades and a compliance schedule. The upgrades are required to be completed by the middle of 2006. Staff anticipate these upgrades will cost an additional \$11 million and have received Provincial and Federal support for a portion of this cost.

### **Sustaining Infrastructure**





**The Waterworks mission supports sustaining infrastructure to ensure reliable service. Over 80 percent of the water system is underground. In 2004, \$800,000 was spent on watermain and valve replacement.**

## **Operating Budget Highlights**

**In 2004, Waterworks budgeted \$2.4 million and \$2.3 million to operate and maintain the water distribution and supply systems respectively.**

**The following maintenance activities were funded by the Waterworks Operating budget in 2004:**

- **Repair of 53 watermain breaks at a cost of \$340,000;**
- **Replacement of 35 watermain valves at a cost of \$220,000;**
- **Repair of 49 fire hydrants at a cost of \$100,000;**
- **Replacement of 739 water meters at a cost of \$187,000; and**
- **Replacement of 8 water supply pumps at a cost of \$320,000.**





**SECTION 7  
COMPLIANCE WITH TERMS AND  
CONDITIONS OF THE CONSOLIDATED  
CERTIFICATE OF APPROVAL**



## **Section 7 Compliance with Terms and Conditions of the Consolidated Certificate of Approval**

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In 2004, Waterworks operated under three Consolidated Certificates of Approval (CC of A). CC of A 2866-5SQHGF was issued on November 18, 2003 and was replaced by CC of A 7094-5WSPR4 on April 7, 2004. The most recent CC of A, 6812-64NQ8U, was issued on September 10, 2004 and replaces the previous CC of A.

In 2004, Waterworks complied with all terms and conditions of each of the CCs of A, the Safe Drinking Water Act, and related regulations. The following section briefly summarizes Waterworks' compliance with main terms and conditions as listed in the various CCs of A.

### ***Certificate of Approval Part 1 – Drinking-Water System Description***

The first section of the CC of A describes the various components of the drinking water system operated by the City.

### ***Certificate of Approval Part 2 – Definitions and Information***

This section of the CC of A provides standard MOE definitions of terms used in the CC of A.

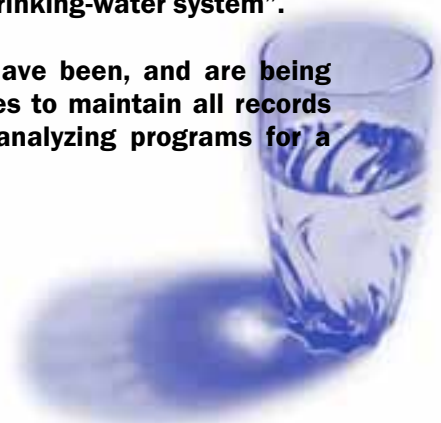
### ***Certificate of Approval Part 3 - General***

In accordance with Part 3 – General, Guelph Waterworks operated the drinking water system in accordance with the *Safe Drinking-Water Act, 2002*. Over 18,000 water quality tests of the Guelph drinking water were performed in 2004. The results demonstrate that Guelph tap water is safe, and are summarized in tables provided in Section 4 of this report. As well, Guelph Waterworks had valid Permits To Take Water for all municipal water supplies at the rates listed in the CC of A.

In 2004, Waterworks informed contractors working on the water supply and distribution systems of the requirements of regulations and legislation related to the work being conducted.

A copy of the CC of A was “kept in a conspicuous place so that it [was] available for reference by all persons responsible for all or part of the operation of the approved drinking-water system”.

All records required by or related in accordance with the CC of A have been, and are being retained for five years in a convenient location. Waterworks continues to maintain all records and information related to water quality monitoring, sampling and analyzing programs for a minimum period of five years.







**Certificate of Approval Part 4 – Performance**

In accordance with Part 4 – Performance, Guelph Waterworks ensured that distribution flows did not exceed the maximum flow rates as set out in the CC of A, *Table 4.1: Rated Capacities*.

**Certificate of Approval Part 5 – Monitoring and Recording**

In accordance with Part 5 – Monitoring and Recording, Guelph Waterworks operated and maintained devices to measure flow rate and daily quantity of water being supplied from each source. All flow measuring devices were checked and calibrated in accordance with the manufacturer’s instructions. In 2004, Waterworks verified the accuracy of each flow measuring device.

In 2004, Waterworks recorded total daily flows at each water supply. This information is provided in summary tables included in Section 9 of this report.

**Certificate of Approval Part 6 – Operations and Maintenance**

In accordance with Part 6 – Operations and Maintenance, Guelph Waterworks ensured that all chemicals used in the operation of the drinking water system met all applicable standards set by the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60 and NSF/61.

With regards to new stock, materials and infrastructure, Waterworks ensured that all new equipment, materials and chemicals complied with the AWWA and ANSI standards

As well, an up-to date operations manual including all information required by the CC of A was maintained and available for reference by all persons responsible for all or part of the operation of the approved drinking-water system.

In 2004, Waterworks maintained procedures for receiving, responding to, and documenting customer complaints. Staff received customer complaints and entered relevant information into the complaints database. This database allowed management to track and resolve issues and review trends in complaint information. In 2004, a total of 294 complaints were recorded in the complaints database. The majority of these complaints were related to yellow or brown water caused by disruption of iron sediment in water mains. The following Table J summarizes the types of complaints received in 2004. “Other” refers to customer inquires related to health concerns, water meters and general information requests.

<b>Table J 2004 Customer Water Quality Complaints</b>	
<b>Number</b>	<b>Complaint Type</b>

238	Discoloured Water
31	Taste and Odour
18	Other
7	Water Pressure

Additionally, up-to-date Process and Instrumentation Diagrams and as-constructed drawings for the drinking water system were kept on site at each drinking water facility.

In 2004, Waterworks continued to follow written standard operating procedures for the notification of both the MOW and local health unit in the event of adverse water quality as defined by the Drinking Water Protection regulation and the Drinking Water Systems regulation.

Further, Waterworks continued to develop the Waterworks Emergency Plan to support the overall City of Guelph Emergency Plan. Staff training was provided on standard operating procedures related to incident and emergency response.

As well, Waterworks ensured the availability of adequate equipment and materials to assist with incident and emergency response.

***Certificate of Approval Part 7 – Future Alteratons***

In 2004, there were no applicable terms and references included in Part 7 – Future Alterations

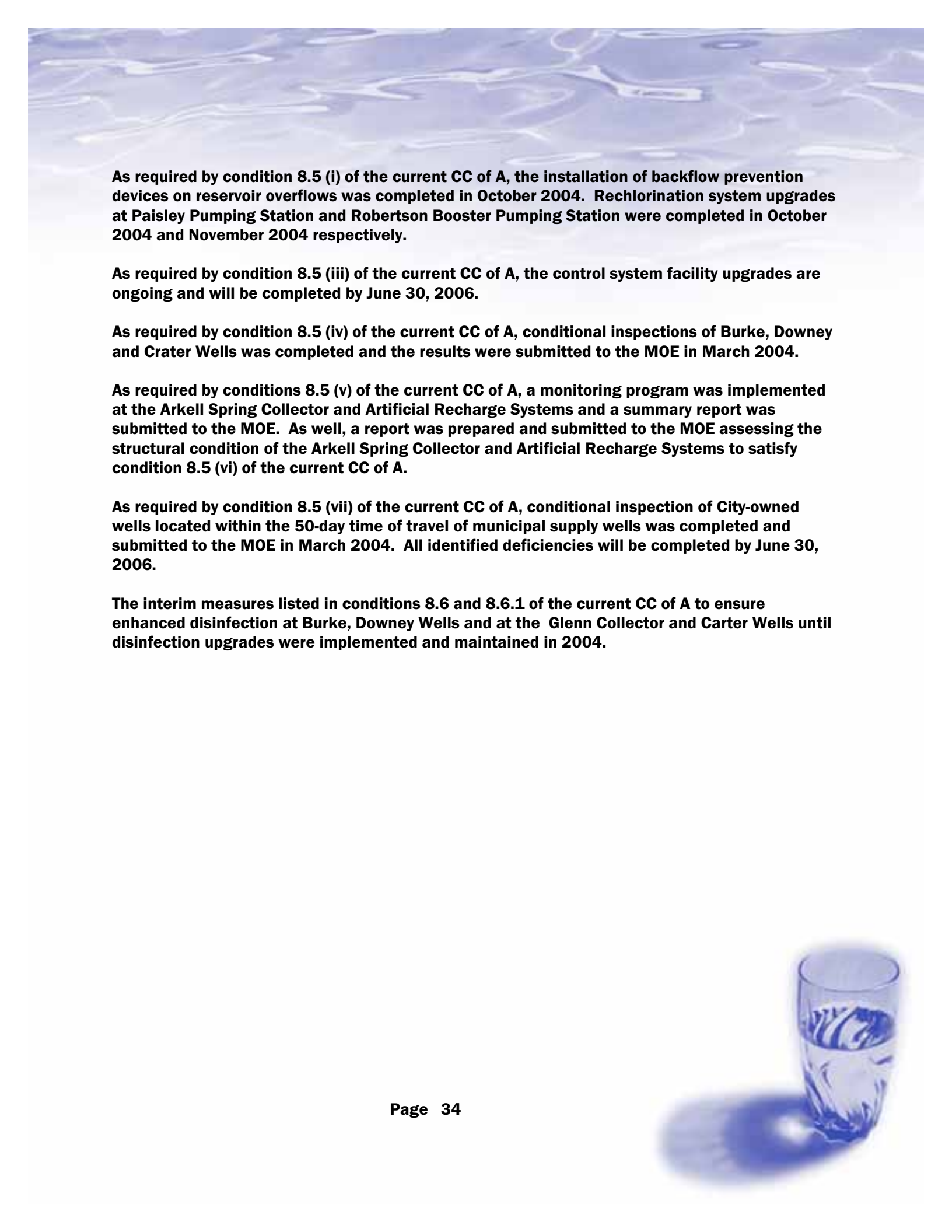
***Certificate of Approval Part 8 – Studles and Upgrades Required***

In response to condition 8.2.1 of the current CC of A, Waterworks submitted to the MOE a hydrogeological report indicating that the Burke and Downey Wells are true groundwater supplies. The report was submitted to the MOE in March of 2004. The MOE responded to the report in December 2004 indicating that they agreed with the assessment that the well supplies are in fact true groundwater. However, the MOE requested continued monitoring of groundwater levels at the Downey Well to provide further evidence of the true groundwater nature of the well. This monitoring will continue through 2005.

As required by condition 8.3 of the current CC of A, the installation of enhanced disinfection upgrades for the Carter Wells and Arkell Glen collector system was commenced in 2004. These upgrades are scheduled for completion by June 30, 2006.

As required by condition 8.4 of the current CC of A, the chlorine contact upgrades at Emma Well and Park Well are nearing completion and will be finished by April 2005. The chlorine contact upgrades required at the Water Street Well should commence in the fall of 2005 and be completed by the spring of 2006.





**As required by condition 8.5 (i) of the current CC of A, the installation of backflow prevention devices on reservoir overflows was completed in October 2004. Rechlorination system upgrades at Paisley Pumping Station and Robertson Booster Pumping Station were completed in October 2004 and November 2004 respectively.**

**As required by condition 8.5 (iii) of the current CC of A, the control system facility upgrades are ongoing and will be completed by June 30, 2006.**

**As required by condition 8.5 (iv) of the current CC of A, conditional inspections of Burke, Downey and Crater Wells was completed and the results were submitted to the MOE in March 2004.**

**As required by conditions 8.5 (v) of the current CC of A, a monitoring program was implemented at the Arkell Spring Collector and Artificial Recharge Systems and a summary report was submitted to the MOE. As well, a report was prepared and submitted to the MOE assessing the structural condition of the Arkell Spring Collector and Artificial Recharge Systems to satisfy condition 8.5 (vi) of the current CC of A.**

**As required by condition 8.5 (vii) of the current CC of A, conditional inspection of City-owned wells located within the 50-day time of travel of municipal supply wells was completed and submitted to the MOE in March 2004. All identified deficiencies will be completed by June 30, 2006.**

**The interim measures listed in conditions 8.6 and 8.6.1 of the current CC of A to ensure enhanced disinfection at Burke, Downey Wells and at the Glenn Collector and Carter Wells until disinfection upgrades were implemented and maintained in 2004.**





**SECTION 8  
NON-COMPLIANCE WITH TERMS  
AND CONDITIONS OF THE CONSOLIDATED CERTIFICATE OF  
APPROVAL AND REGULATIONS**



## **Section 8 Non-Compliance with Terms and Conditions of the Certificate of Approval and Regulations**

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**This section of the Summary Report consists of a short description of issues of non-compliance with the terms and conditions as listed in the CC of A and with applicable provincial regulations.**

**In 2004, there were no instances in which Waterworks operations were conducted in non-compliance with the terms and conditions listed in the CC of A.**

**The promulgation of the Ontario “Drinking Water Protection Regulation 459/00” in August of 2000 placed a number of Guelph Waterworks facilities in non-compliance in terms of disinfection treatment. MOE procedure B13-3 entitled “Chlorination of Potable Water Supplies in Ontario, January 2001”, requires all supply facilities to have chlorine contact chambers providing a minimum of 15 minutes of effective chlorine contact time. The following facilities were found not to comply with this requirement, and continue to be in non-compliance as of the date of this report:**

- 1. Park Well (expected compliance April 2005);**
- 2. Emma Well (expected compliance April 2005);**
- 3. Water Street Well (expected compliance April 2006); and**
- 4. Downey Well (expected compliance March 2006).**

**At no time in 2004 did the operation of these supplies result in the provision of unchlorinated or unsafe water to customers.**





**SECTION 9**  
**SUMMARY OF SODIUM ANALYTICAL RESULTS**



## **Section 9 Summary of Sodium Analytical Results**

Guelph Waterworks is required to periodically report to the Wellington-Dufferin-Guelph Health Unit (WDGHU) the sodium sampling results for all facilities. This information has been incorporated into this Summary Report in order to effectively disseminate this information to all Waterworks customers and other interested parties. The MOE requires that sodium sampling be conducted every five years for all points of entry into the water distribution system. The results of the 2004 sampling are included in Table K.

<b>Table K 2004 Sodium Analytical Results</b>	
<b>Facility</b>	<b>Sodium Result (mg/L)*</b>
Burkes Well	18.1
Downey Well	33.6
University Well	65.7
Dean Well	90.9
Membro Well	93.1
Water Street Well	81.6
Queensdale Well	19.4
Paisley Booster Station	29.5
Calico Well	25.2
Helmar Well	19.3
Park Wells (combined)	93.3
Emma Well	52
F. M. Woods Station	14.9
Clythe Booster Station	15
Robertson Booster Station	64.5

mg/L – milligrams per litre  
\*Ontario Drinking Water Standard for sodium is 200 mg/L





**SECTION 10  
SUMMARY OF QUANTITY  
OF WATER SUPPLIED**

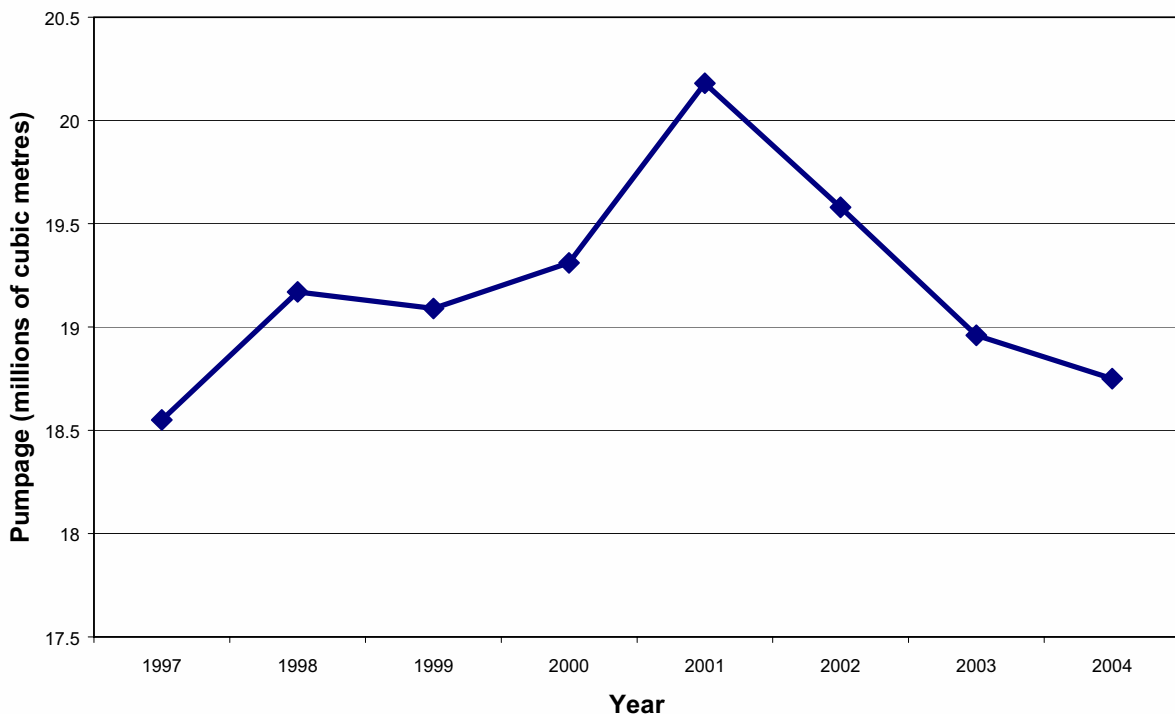




## **Section 10 Summary of Quantity of Water Supplied**

In 2004, 19 of 20 water supplies were operated to satisfy customer water demand. A total of 18,749,923 cubic metres of water was pumped to the water distribution system. This total represents a 0.8 percent decrease from the previous year's total. A graph showing the eight year trend in total water pumpage is shown in Figure B.

**Figure B - Eight Year Trend of Total Annual Water Pumpage**



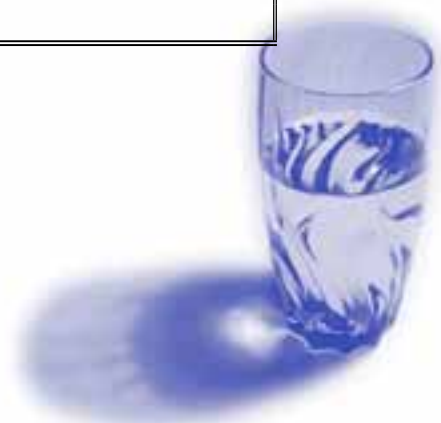
The 2004 total average day demand was 51,229 cubic metres per day. This volume is lower than the current dry perennial water system capacity of 63,000 cubic metres per day. The continuous multi-year drought, degradation in water quality, and compliance with new regulations has reduced system capacity below the rated capacity of about 75,000 cubic metres per day.

The following Tables L and M detail 2004 monthly maximum daily pumpage, instantaneous flow, and monthly average pumpage from all active water supplies.



**Table L 2004 Pumpage Summary**

	<b>Arkell 1</b>	<b>Arkell 6</b>	<b>Arkell 7</b>	<b>Arkell 8</b>	<b>Arkell Collectors</b>	<b>Arkell Recharge</b>	<b>Carter</b>
<b>Monthly Maximum Day in Cubic Metres Per Day</b>							
<b>Capacity</b>	<b>3,273</b>	<b>6,546</b>	<b>6,546</b>	<b>6,546</b>	<b>25,000</b>	<b>**9,092</b>	<b>7,855</b>
<b>Jan-04</b>	758	6,034	6,276	6,040	5,489	0	6,230
<b>Feb-04</b>	2,631	5,964	6,203	6,250	8,462	0	6,760
<b>Mar-04</b>	2,020	5,947	6,259	6,310	7,501	0	6,050
<b>Apr-04</b>	1,818	5,171	5,627	5,300	15,402	8,640	6,030
<b>May-04</b>	1,821	4,941	5,579	4,830	17,848	8,478	3,310
<b>Jun-04</b>	1,822	5,514	5,351	4,770	17,208	8,284	4,830
<b>Jul-04</b>	1,797	5,627	5,397	5,740	15,578	8,092	5,810
<b>Aug-04</b>	1,794	5,092	4,934	4,640	13,256	8,048	4,410
<b>Sep-04</b>	1,744	5,790	5,439	5,060	11,254	7,983	5,200
<b>Oct-04</b>	1,736	5,628	6,225	5,924	9,176	7,972	5,220
<b>Nov-04</b>	1,727	5,487	6,034	6,140	9,504	8,399	5,150
<b>Dec-04</b>	1,735	5,954	6,107	6,200	5,421	0	5,190
<b>Monthly Maximum Flow Rate in Litres Per Second</b>							
<b>Capacity</b>	<b>56.8</b>	<b>113.7</b>	<b>113.7</b>	<b>113.7</b>	<b>433.33</b>	<b>Not Applicable</b>	<b>136.4</b>
<b>Jan-04</b>	8.8	69.8	72.6	69.9	63.5	0.0	72.1
<b>Feb-04</b>	30.5	69.0	71.8	72.3	97.9	0.0	78.2
<b>Mar-04</b>	23.4	68.8	72.4	73.0	86.8	0.0	70.0
<b>Apr-04</b>	21.0	59.8	65.1	61.3	178.3	100.0	69.8
<b>May-04</b>	21.1	57.2	64.6	55.9	206.6	98.1	38.3
<b>Jun-04</b>	21.1	63.8	61.9	55.2	199.2	95.9	55.9
<b>Jul-04</b>	20.8	65.1	62.5	66.4	180.3	93.7	67.2
<b>Aug-04</b>	20.8	58.9	57.1	53.7	153.4	93.1	51.0
<b>Sep-04</b>	20.2	67.0	63.0	58.6	130.3	92.4	60.2
<b>Oct-04</b>	20.1	65.1	72.0	68.6	106.2	92.3	60.4
<b>Nov-04</b>	20.0	63.5	69.8	71.1	110.0	97.2	59.6
<b>Dec-04</b>	20.1	68.9	70.7	71.8	62.7	0.0	60.1
* Flow increased to replace supply out of service for maintenance.							
** Capacity varies depending on time of year.							



**Table L 2004 Pumpage Summary Continued**

	<b>Burke</b>	<b>Calico</b>	<b>Clythe Well</b>	<b>Clythe Booster</b>	<b>Dean</b>	<b>Downey</b>	<b>Emma</b>	<b>Helmar</b>
<b>Monthly Maximum Day in Cubic Metres Per Day</b>								
<b>Capacity</b>	<b>6,546</b>	<b>5,237</b>	<b>5,237</b>	<b>5,443</b>	<b>2,300</b>	<b>5,237</b>	<b>3,100</b>	<b>3,273</b>
<b>Jan-04</b>	5,836	905	0	5,264	1,428	4,447	2,882	989
<b>Feb-04</b>	5,751	880	0	5,196	1,385	4,442	2,524	898
<b>Mar-04</b>	5,788	852	0	5,194	1,347	4,631	2,684	890
<b>Apr-04</b>	5,750	825	0	5,103	1,335	4,822	2,501	888
<b>May-04</b>	5,783	863	0	5,153	1,336	4,678	2,718	0
<b>Jun-04</b>	5,716	897	0	5,131	1,425	4,502	2,984	0
<b>Jul-04</b>	5,753	939	0	5,113	1,342	4,570	2,452	0
<b>Aug-04</b>	5,740	1,053	0	5,086	1,315	4,351	2,487	955
<b>Sep-04</b>	5,766	1,035	0	2,700	1,377	4,305	2,295	1,238
<b>Oct-04</b>	5,722	1,220	0	2,674	1,310	4,377	0	1,339
<b>Nov-04</b>	5,670	1,090	0	0	1,350	4,443	0	1,260
<b>Dec-04</b>	5,671	1,086	0	0	1,433	4,214	0	1,258
<b>Monthly Maximum Flow Rate in Litres Per Second</b>								
<b>Capacity</b>	<b>113.7</b>	<b>90.9</b>	<b>90.9</b>	<b>189</b>	<b>39.9</b>	<b>90.9</b>	<b>53.8</b>	<b>56.8</b>
<b>Jan-04</b>	67.5	10.5	0.0	60.9	16.5	51.5	33.4	11.4
<b>Feb-04</b>	66.6	10.2	0.0	60.1	16.0	51.4	29.2	10.4
<b>Mar-04</b>	67.0	9.9	0.0	60.1	15.6	53.6	31.1	10.3
<b>Apr-04</b>	66.6	9.5	0.0	59.1	15.5	55.8	28.9	10.3
<b>May-04</b>	66.9	10.0	0.0	59.6	15.5	54.1	31.5	0.0
<b>Jun-04</b>	66.2	10.4	0.0	59.4	16.5	52.1	34.5	0.0
<b>Jul-04</b>	66.6	10.9	0.0	59.2	15.5	52.9	28.4	0.0
<b>Aug-04</b>	66.4	12.2	0.0	58.9	15.2	50.4	28.8	11.1
<b>Sep-04</b>	66.7	12.0	0.0	31.3	15.9	49.8	26.6	14.3
<b>Oct-04</b>	66.2	14.1	0.0	30.9	15.2	50.7	0.0	15.5
<b>Nov-04</b>	65.6	12.6	0.0	0.0	15.6	51.4	0.0	14.6
<b>Dec-04</b>	65.6	12.6	0.0	0.0	16.6	48.8	0.0	14.6



**Table L 2004 Pumpage Summary Continued**

	<b>Membro</b>	<b>Palsley Well</b>	<b>Palsley Booster</b>	<b>Park</b>	<b>Queensdale</b>	<b>Robertson Booster</b>	<b>University</b>	<b>Water</b>	<b>Woods</b>
<b>Monthly Maximum Day in Cubic Metres Per Day</b>									
<b>Capacity</b>	<b>6,050</b>	<b>3,200</b>	<b>13,738</b>	<b>10,300</b>	<b>5,237</b>	7,200	<b>3,300</b>	<b>3,400</b>	<b>65,000</b>
<b>Jan-04</b>	5,133	1,493	6,380	6,710	1,221	3,009	1,808	1,821	27,900
<b>Feb-04</b>	5,700	1,564	5,850	8,430	1,305	5,558	1,810	1,829	27,530
<b>Mar-04</b>	4,629	1,555	5,880	8,350	1,279	3,163	1,817	1,876	28,410
<b>Apr-04</b>	4,441	1,406	6,980	7,800	1,297	5,309	1,889	1,824	29,210
<b>May-04</b>	4,460	1,384	7,160	4,540	1,313	5,742	1,829	1,775	32,960
<b>Jun-04</b>	4,492	0	8,570	6,730	1,405	5,588	1,944	1,829	35,290
<b>Jul-04</b>	4,496	1,197	7,700	6,680	1,295	3,429	1,830	1,729	32,940
<b>Aug-04</b>	4,196	1,441	8,200	6,690	1,362	4,965	1,800	1,491	29,370
<b>Sep-04</b>	4,205	1,437	8,080	6,660	1,356	4,370	1,850	1,857	30,850
<b>Oct-04</b>	4,228	1,384	8,260	6,530	1,304	4,535	1,804	1,674	27,460
<b>Nov-04</b>	4,422	1,360	8,650	6,380	1,410	6,419	1,752	1,925	26,310
<b>Dec-04</b>	3,963	1,346	8,220	3,850	1,502	6,417	1,782	1,955	27,120
<b>Monthly Maximum Flow Rate in Litres Per Second</b>									
<b>Capacity</b>	<b>105</b>	<b>55.6</b>	<b>511</b>	<b>178.8</b>	<b>90.9</b>	83.3	<b>57.3</b>	<b>59</b>	<b>1,592</b>
<b>Jan-04</b>	59.4	17.3	73.8	77.7	14.1	34.8	20.9	21.1	322.9
<b>Feb-04</b>	66.0	18.1	67.7	97.6	15.1	64.3	20.9	21.2	318.6
<b>Mar-04</b>	53.6	18.0	68.1	96.6	14.8	36.6	21.0	21.7	328.8
<b>Apr-04</b>	51.4	16.3	80.8	90.3	15.0	61.4	21.9	21.1	338.1
<b>May-04</b>	51.6	16.0	82.9	52.5	15.2	66.5	21.2	20.5	381.5
<b>Jun-04</b>	52.0	0.0	99.2	77.9	16.3	64.7	22.5	21.2	408.4
<b>Jul-04</b>	52.0	13.9	89.1	77.3	15.0	39.7	21.2	20.0	381.3
<b>Aug-04</b>	48.6	16.7	94.9	77.4	15.8	57.5	20.8	17.3	339.9
<b>Sep-04</b>	48.7	16.6	93.5	77.1	15.7	50.6	21.4	21.5	357.1
<b>Oct-04</b>	48.9	16.0	95.6	75.6	15.1	52.5	20.9	19.4	317.8
<b>Nov-04</b>	51.2	15.7	100.1	73.8	16.3	74.3	20.3	22.3	304.5
<b>Dec-04</b>	45.9	15.6	95.1	44.6	17.4	74.3	20.6	22.6	313.9



**Table M 2004 Monthly Average Daily Pumpage  
in Cubic Metres Per Day**

	<b>Arkell 1</b>	<b>Arkell 6</b>	<b>Arkell 7</b>	<b>Arkell 8</b>	<b>Arkell Collectors</b>	<b>Arkell Recharge</b>	<b>Carter</b>
<b>Capacity</b>	3,273	6,546	6,546	6,546	25,000	9,092	7,855
<b>Jan-04</b>	0	5,137	5,491	5,434	4,420	0	3,502
<b>Feb-04</b>	908	5,887	6,071	5,670	3,350	0	4,620
<b>Mar-04</b>	1,575	6,338	6,127	5,801	2,769	0	3,718
<b>Apr-04</b>	1,007	6,237	3,939	5,235	3,700	1,567	5,989
<b>May-04</b>	843	4,095	4,415	4,049	9,625	8,111	4,167
<b>Jun-04</b>	904	1,412	5,089	4,611	11,137	7,956	3,964
<b>Jul-04</b>	1,039	4,137	3,974	3,520	9,990	7,610	2,234
<b>Aug-04</b>	953	4,589	4,212	4,022	8,410	4,574	376
<b>Sep-04</b>	917	4,714	4,700	4,655	3,832	0	4,616
<b>Oct-04</b>	918	4,586	4,808	4,656	8,121	8,109	2,234
<b>Nov-04</b>	905	3,215	5,069	4,578	7,687	3,347	1,516
<b>Dec-04</b>	740	5,208	5,657	5,071	4,522	0	3,031

	<b>Burke</b>	<b>Calico</b>	<b>Clythe Well</b>	<b>Clythe Booster</b>	<b>Dean</b>	<b>Downey</b>	<b>Emma</b>
<b>Capacity</b>	6,546	5,237	5,237	5,443	2,300	5,237	3,100
<b>Jan-04</b>	5,811	842	0	5,119	1,361	4,422	2,743
<b>Feb-04</b>	5,718	857	0	4,905	1,283	4,419	2,333
<b>Mar-04</b>	5,711	827	0	5,018	1,270	1,681	2,438
<b>Apr-04</b>	5,408	528	0	4,957	1,279	4,314	2,407
<b>May-04</b>	5,718	785	0	5,026	1,158	4,045	2,579
<b>Jun-04</b>	5,123	840	0	4,786	1,297	4,456	2,271
<b>Jul-04</b>	5,689	887	0	5,052	1,288	4,366	2,323
<b>Aug-04</b>	5,672	946	0	4,050	1,198	4,311	2,341
<b>Sep-04</b>	5,724	884	0	2,644	1,291	4,267	527
<b>Oct-04</b>	3,581	938	0	1,182	1,264	4,189	0
<b>Nov-04</b>	5,637	1,038	0	0	1,223	4,199	0
<b>Dec-04</b>	5,537	1,011	0	0	1,369	4,167	0



**Table M 2004 Monthly Average Daily Pumpage  
In Cubic Metres Per Day Continued**

	<b>Helmar</b>	<b>Membro</b>	<b>Palsley Well</b>	<b>Palsley Booster</b>	<b>Park</b>
<b>Capacity</b>	<b>3,273</b>	6,050	<b>3,200</b>	<b>13,738</b>	<b>10,300</b>
<b>Jan-04</b>	894	1,217	1,488	5,459	2,796
<b>Feb-04</b>	841	785	1,402	5,233	7,092
<b>Mar-04</b>	882	3,987	1,424	5,214	5,537
<b>Apr-04</b>	586	1,066	1,389	5,460	4,871
<b>May-04</b>	0	1,178	1,043	5,817	2,457
<b>Jun-04</b>	0	2,022	0	6,537	3,789
<b>Jul-04</b>	0	2,814	413	6,392	4,171
<b>Aug-04</b>	163	3,514	1,156	6,851	3,338
<b>Sep-04</b>	905	4,153	1,408	7,234	5,585
<b>Oct-04</b>	1,199	3,767	1,336	7,238	5,151
<b>Nov-04</b>	1,236	3,910	1,352	7,533	3,744
<b>Dec-04</b>	1,227	3,393	1,337	7,245	2,763

	<b>Robertson Booster</b>	<b>Queensdale</b>	<b>Unlversity</b>	<b>Water</b>	<b>Woods</b>
<b>Capacity</b>	<b>7,200</b>	<b>5,237</b>	<b>3,300</b>	<b>3,400</b>	<b>65,000</b>
<b>Jan-04</b>	2,217	1,171	1,171	1,613	24,762
<b>Feb-04</b>	3,055	1,225	1,744	1,655	23,393
<b>Mar-04</b>	2,735	1,157	1,631	1,744	24,550
<b>Apr-04</b>	2,832	1,189	1,777	1,764	24,756
<b>May-04</b>	3,063	1,205	1,777	1,075	28,033
<b>Jun-04</b>	3,288	1,280	1,779	1,438	29,229
<b>Jul-04</b>	2,827	1,253	1,757	530	27,081
<b>Aug-04</b>	3,205	1,259	1,722	461	26,019
<b>Sep-04</b>	3,410	1,260	1,730	1,253	25,264
<b>Oct-04</b>	3,632	1,232	1,726	1,602	24,101
<b>Nov-04</b>	4,030	1,325	1,729	1,309	21,106
<b>Dec-04</b>	3,939	1,423	1,721	1,556	22,891





**APPENDIX A  
CONSOLIDATED CERTIFICATE OF APPROVAL**

